THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL XIII. Copyright, 1883, JAMES R. OSGOOD & Co., Boston, Mass. No. 388.

JUNE 2, 1883.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS.

SUMMARY:—
Professor Chandler and the Presidency of the New York Board of Health.—The New York Inspector of Buildings and Fire-Escapes.—The Annual Meeting of the Archæological Institute of America.—A Party-Wall Case in Cincinnati.—Education in the Industrial Arts in France.—The Present Condition of French Industrial Art.—Straightening River Courses.—An Electrical Railway in New Jersey. 253
FLITCH-PLATE GIRDERS.—I. 255
BUILDING SUPERINTENDENCE.—XXX. 256
THE ILLUSTRATIONS:—
House at Indianapolis.—Designs for $3,000-Houses.—Design for a Receiving Tomb. 258
THE $3,000-HOUSE COMPETITION.—XIII. 258
THE SALE OF THE HURLBERT COLLECTIONS. 259
THE BLISTERING OF PAINT. 260
HYDRAULIC RAMS. 261
BITUMINIZED BRICKS. 261
COMMUNICATIONS:—
"Rambling Sketches."—"Original Portraits of Washington."—Sub-Surface Drainage.—Books for Beginners.—Our Illustrations. 262
NOTES AND CLIPPINGS. 262

THE city of New York is in danger of losing the services of another public officer, who, like the Inspector of Buildings, has shown himself too sincere and energetic in the execution of what he regarded as his duty to suit the taste of that singular body of persons which administers the affairs of the largest community on the continent. After some fifteen years of untiring and intelligent devotion to the public good, in various ways, Professor Charles F. Chandler, the President of the Board of Health, has been rejected by the Aldermen of the city as a candidate for reappointment. No reason is assigned for this action. Professor Chandler was renominated by the Mayor as a matter of course, and his selection was applauded, so far as can be discovered, by every respectable citizen; but his administration of his office has no doubt already made a sufficient inroad upon the profits of the business which flourishes most amid filth and misery to alarm the ruling class, and compel the removal of a person of such unpleasant activity. Fortunately for the people of the city, their other vigilant and skilful guardian, the Inspector of Buildings, is somewhat protected against the attacks of those who make money out of suffering, by the law under which his office is constituted, which makes him an appointee of the Fire Commissioners, instead of the Aldermen. Those who wish, for their private purposes, to get him out of the way are obliged to adopt a roundabout way of doing it, and seem to have hit upon the idea of driving him to distraction by ceaseless quarrels, anxieties, ingratitude and misrepresentation, as the quickest method of getting rid of him. It is to be regretted that the daily papers, in their eagerness after new scandals, unintentionally allow themselves in this way to be made the tools of designing persons, to torment and distress by the publication of the most absurd articles, an official whose unflinching zeal for the good of his fellow-citizens would naturally make him the more sensible of that appreciation which they owe to him in return.

AMONG the more recent of the foolish stories regarding the Inspector is one which was published in the *Commercial Advertiser* not long ago. In this he was charged with being a victim to the "fire-escape mania;" and the assertion was made that he had ordered escape-ladders to be placed on fire-proof buildings; and that his object in insisting upon fire-escapes on street fronts was "seemingly the attainment of a uniformity of ugliness," with much other matter equally unfounded and ridiculous. It appears to us that the editor of an influential newspaper might exercise some discretion about giving currency to such silly attacks upon a faithful public servant; or might at least nullify their effect by a few words of common-sense; but that seems to be too much to expect of New York journalsm, and the Inspector, in default of other defenders, is obliged to say a few words in his own behalf, which he does in a well-written letter. To the accusation that he has caused escape-ladders to be placed on fire-proof buildings he replies by a request, which is of course unanswerable, that some example of such indiscretion should be mentioned; and the assertion that the beauty of fine façades is spoiled by iron ladders is met by the concise and incontrovertible statement that such things are not ordered by the Department for any building so long as other methods are available for securing the safety of its occupants in case of fire; but that if the choice has to be made between risking human life and putting on outside fire-escapes, the Department conceives the latter to be the lesser evil. There is a certain meaning in the way in which the letter adds that "it is a mistake to suppose that fire-escapes must be ugly in appearance to be approved by the Inspector," and some of our younger architects might do worse than take the hint, and try to make something out of a motive which they will have ample occasion to deal with. After all, as the Inspector says, it is faulty planning which makes fire-escapes necessary; and if his strict enforcement of the law should lead to a demand for some improvement in the dull and brainless design common to a certain class of structures in our cities, the architects will have no reason to regret it; while generations of the future theatre-goers, hotel guests and working men and women of New York will have reason to bless the memory of the Inspector of Buildings who had the "fire-escape mania."

THE last annual meeting of the Archæological Institute of America, held in Boston a week or two ago, seems to have been unusually interesting and well attended, several members having made the journey from New York to be present. Much as the Institute has done in the way of archæological research, it would seem that the greatest difficulty which its officers experience is found in the necessity for choosing, among the many tempting opportunities offered for increasing the stock of the world's knowledge, the one which promises the best results in return for the very limited sums which the Institute can devote to it. For the present season, the modest amount of four thousand dollars is needed to complete the explorations at Assos, which have proved so successful, and a small farther sum is asked for, to pay for printing the report of Mr. Bandelier's expedition among the almost unknown Indian tribes of Mexico. There can be little doubt that the money for these purposes will be easily raised, and it is impossible not to wish that ten or twelve times as much might be added to it, for the sake of beginning farther investigations at once. The remarkable results which have been obtained at Assos with the smallest possible outlay, by the judicious and self-sacrificing labor of Messrs. Clarke and Bacon and their assistants, might, it would seem, be perhaps surpassed if the same energetic and skilful explorers could be retained in the service of the Institute, and transferred to a new field.

A RATHER singular case in relation to a party-wall has just been decided in Cincinnati, the decision covering very much the same ground as one or two recently made in Massachusetts. It seems that about fifty years ago a block of three brick stores was built in that city, divided by party-walls. The original builder sold the whole block to a syndicate of three persons, who afterwards divided the property among themselves, each taking one store. The division between the estates was described in the deeds as being the centre line of the partition wall, but no other agreement in regard to the wall seems to have been made. The estates have passed through several hands, and the present owner of one of them recently undertook to improve it by reconstructing all the walls, but was stopped by an injunction of court, forbidding any interference whatever with the party-walls, on the ground that they could not be removed without mutual consent. The hearing was on a motion to dissolve the injunction, which was granted, the judge holding that the universal practice in matters of party-walls permitted either owner to rebuild them, with or without the consent of the other, who, as the judge said, had certainly no right to prevent his neighbor from using his property as he might think best.

A MOVEMENT has been recently begun in France for the instruction of the poorer class of children in the theory as well as the practice of the industrial arts. For some years the associations of the various trades have maintained apprentices' schools, which have been, and still continue to be of great use, but the subject has now assumed sufficient importance to attract the attention of the Government, and a work has been undertaken which will be followed with interest by the friends and promoters of the similar movement now well under way in our own country. The first step taken under the direction of the French Government was the appointment of two commissions, one charged with the duty of inquiring into the conditions under which manual exercises could best be introduced into the primary schools of Paris, and the other with that of examining and reporting upon the existing apprentices' schools, as well as of investigating the practicability of establishing similar ones under the supervision of the public officers. The former of these seems to have completed its labors some time ago, and instruction in manual work already forms a part of the primary school course. The second commission, although its investigations were completed, and its report presented, in 1881, has only just had the satisfaction of seeing its recommendations carried into effect.

AS in every civilized country, the skill of workmen in the various industrial arts of France has within the last hundred years steadily declined. The cause of the decline is unquestionably to be found in the multiplication of labor-saving machines, and the division of labor, which have together reduced men to the condition of automata, each doing his unvarying task without thought; but the remedy for it is not so easily discovered. That some remedy is needed can hardly be denied, for, however profitable it may be to manufacturers of a certain class to have their work done by semi-animate machines instead of human beings, it is certainly an injury to the latter to pass their lives almost without mental effort; while industry in general suffers in the end by the discouragement of that quick-witted comprehension of the relation of means to ends which has hitherto done so much for the development of the arts in France. The most certain cure, in the opinion of the Commission, for the mental sluggishness to which the present system leads, is to be sought in the elevation of the standard of technical acquirement among the great body of workmen, not only by means of a systematic training of the eye and hand which should lead to the highest manual expertness, but by instruction in principles, which may serve to open the minds of pupils to a better comprehension of their future work, and will have the farther advantage of rendering them less helpless in case of those struggles between employers and employed which are now so disastrous to both. For the purpose of putting in practice on a suitable scale the ideas upon which the members unanimously agree, the Commission makes a recommendation that a school should first be established for the purpose of teaching the building trades, in which the arts of stone-cutting, framing, carving in stone and wood, joinery, roofing, casting, forging and fine metal-work, painting and glazing, might all be taught together, to the same pupils, who would thus gain the advantage which the Commission desires to secure in their future practice of any particular one of the correlated arts; while they would be fortified for the contingencies which their subsequent life might have in store by their more extended experience, as well as their increased mental capacity. Besides this special school for boys the Commission advises the establishment of a school for girls, in which some of the industries best fitted to their sex should be taught, at the same time with the great feminine art of housekeeping, which, as is wisely observed, the daughters of poor families, hurried into manufactories as soon as they are capable of earning anything, seldom have the opportunity of acquiring. There is something particularly pleasant in the thoughtfulness with which this important point is dwelt upon, and the means which the Commission suggests for securing the advantages of tuition to the very poorest children shows the same sympathy with their feelings and needs. Experience shows that young persons in such schools, after a year's training has given them a certain degree of manual dexterity, and fitted them to earn something by their labor, are then very often taken away, and placed in factories, where they can gain a few francs a week for their family. It would be hard to forbid this practice, detrimental as it is to the interests of the children, and the Commission proposes to prevent it by paying the pupils, after they have become proficient enough to be worth a salary elsewhere, something like what they would receive in the factories which compete with the school for them; furnishing, for example, a daily dinner to all pupils of a year's standing, and to those who have spent two years in the school a weekly salary in addition. Whether this last recommendation is to be carried out or not we do not know, but the suggestions of the Commission in regard to the establishment of the building school for boys, and the industrial and housekeeping school for girls, have been adopted, and the necessary steps have been taken for putting them in execution on an immense scale.

EXPERTS in hydraulic works are now agreed that the plan of cutting away the banks in the hope of straightening the course of a river is an unnatural and costly expedient, which should be resorted to only in case of pressing necessity, and at the best offers only a small hope of success; while, besides the inevitable lowering of the water-level in the upper reservoir, it is sure to entail the risk of injury to navigation in the sharper curves, as well as of disastrous accidents through floods, or by the action of ice, not only to the new dikes, but to the natural banks, denuded of their protection. The inexperienced engineer is apt to be misled by the apparent advantages of a rectilinear course, which seems at first sight the simplest, and best adapted to the needs both of navigators and riparian proprietors; yet all experience shows that such a course is practically objectionable. To restrain the current in a straight channel is almost impossible. The banks and bottom of the stream are never firm enough to be wholly unaffected by the action of the water, and are usually subject to alteration from the slightest cause. The deposition of silt soon gives some curvature to the bed, and the power of the current, increasing as the curvature adds a centrifugal force to its movement, tends more and more to cut away the concave side. This is, in some respects, advantageous to navigation, while the defence of the banks is rendered more effective by fortifying the concave sides. Moreover, the effect of floods in a crooked channel is less felt, and is less dangerous to the country lying near, than in a straight stream. The knowledge of all this has led, in Germany, to the promulgation of an order recommending that the "canalization," to which streams are continually subjected in that country, should be done with a view to preserving the natural curves as far as possible. To prevent still farther the obstruction of the natural course of the water by the undermining and collapse of artificial embankments, it is common there, even for small streams, to use the mattress revetting first employed, if we are not mistaken, on our Mississippi. The mattresses, made of twigs or fascines, strongly bound together, sink gradually, if the current should wash the earth out from beneath them, accommodating themselves to the new slope of the bank, instead of precipitating themselves in a heap into the water, and it is possible even to load and defend them with masses of stone, without lessening their valuable properties.

AN electrical railway is nearly ready for operation in New Jersey, where trials have been made with a view to employing motors as a substitute for horses in propelling the cars of the Newark and Bloomfield street-railway. So far, the cars have been run only on a small experimental track, but within a few weeks it is intended to place them on the main line. The motors used are constructed by the Daft Electric Company and present the peculiarity of employing a current of very low tension, so that there is no difficulty in insulating it, and the rails may be used as conductors without much fear of loss of power. The other chief objection to the use of the rails as conductors, that animals crossing the track would be exposed to great danger, is also removed by the low tension of the current, as a man can form a connection with his hands between the electrified rails without inconvenience, and almost without sensation, although the current is so strong that a copper or platinum wire placed in the same position is instantly burned up. The cost of operating the line by electricity is estimated at about one-third that of using horse-power, and although for a time some annoyance may be experienced from mischievous boys, who, by short-circuiting the current with a crow-bar laid across the tracks can stop all the cars, the officers of the company believe that this amusement will soon lose its novelty, and interference will cease.

FLITCH-PLATE, RIVETED AND TRUSSED GIRDERS.

IN forming floors where the common floor-joists rest on girders, two conditions are especially to be considered: First, that the supports of the girders shall be as few and far apart as possible, and second, that the girders shall have as little depth as possible.

Where wooden girders are used, the depth is practically limited to 14 inches; a 12″ x 14″ hard-pine timber being the largest size ordinarily used for a single beam. The breadth of the beam can be increased to any extent by placing two or more timbers side by side, but it is not generally economical or practicable to use a wooden girder larger than 14″ x 18″. Taking the weight of the floor and its greatest load at 125 pounds per square foot (the lowest limit for public buildings and factories, and too small for large warehouses), a 12″ x 14″ hard-pine girder of 25-foot span should not be placed more than 7′ 4″ on centres, nor should the span be increased beyond 25 feet, even though the beams be placed nearer together, as the deflection would be too great. Hence, if we wish to employ wooden girders, and desire a greater span or a greater distance between girders, we must employ some method of strengthening the timber. There are two ways in which it is found practicable to strengthen wooden girders — one is to bolt a plate of iron the full depth of the beam between two wooden beams, thus making what is called a flitch-plate girder; and the other is to truss the beam either with belly-rods or struts and rods, thus making what is called a trussed beam. Beams trussed in these ways differ from a truss proper, in that the wooden beam is in one piece, while a truss is supposed to be made up of different pieces united at points called joints.

FLITCH-PLATE GIRDERS.

In framing large buildings it often occurs that the floors must be supported upon girders which themselves rest upon columns, and it is required that the columns shall be spaced farther apart than would be allowable if simple wooden girders were used. In such cases the flitch-plate girder may be used, oftentimes with advantage. A section and elevation of a flitch-plate girder is shown in Figure 1.

Fig. 1.

The different pieces are bolted together every two feet by ¾″ bolts, as shown in elevation.

It has been found in practice that the thickness of the iron plate should be about one-twelfth of the whole thickness of the beam, or the thickness of the wood should be eleven times the thickness of the iron. As the elasticity of iron is so much greater than that of wood, we must proportion the load on the wood so that it shall bend the same amount as the iron plate, otherwise the whole strain might be thrown on the iron plate. The modulus of elasticity of wrought-iron is about thirteen times that of hard-pine, or a beam of hard-pine one inch wide would bend thirteen times as much as a plate of iron of the same size under the same load. Hence, if we want the hard-pine beam to bend the same as the iron plate, we must put only one-thirteenth as much load on it. If the wooden beam is eleven times as thick as the iron one, we should put eleven-thirteenths of its safe load on it, or what amounts to the same thing, use a constant only eleven-thirteenths of the strength of the wood. On this basis the following formulæ have been made up for the strength of flitch-plate girders, in which the thickness of iron is one-twelfth of the breadth of the beam, approximately: —

Let D = depth of beam.
B = total thickness of wood.
L = clear span in feet.
t = thickness of iron plate.
f = { 100 lbs. for hard-pine. / 73 lbs. for hard spruce.
W = total load on girder.

Then safe load at centre in lbs. $= \frac{D^2}{L}\ (fB + 720\ t)$. (1.)

Safe distributed load in lbs. $= \frac{2D^2}{L}\ (fB + 750\ t)$. (2.)

For distributed load, $D = \sqrt{\frac{W\ L}{2\ fB + 1500\ t.}}$ (3.)

For load at centre, $D = \sqrt{\frac{W\ L}{fB + 750\ t.}}$ (4.)

As an example of the use of this kind of girder we will take the case of a railway station in which the second story is devoted to offices, and where we must use girders to support the second floor of 25-foot span, and not less than 12 feet on centres if we can avoid it. This would give us to be supported by the girder a floor area of 12′ x 25′ = 300 square feet, and allowing 105 pounds per square foot as the weight of the superimposed load and of the floor itself, we have 31500 pounds as the load to be supported by the girder. Now we find by computation that if we were to use a solid girder of hard-pine it would require a 14″ x 17″ beam. If we were to use an iron beam we find that a 15″ heavy iron beam would not have the requisite strength for this span, and that we would be obliged to use two 12″ beams.

We will now see what size of flitch-plate girder we would require, should we decide to use such a girder. We will assume the breadth of both beams to be 12″, so that we can use two 6″ timbers, which we will have hard-pine. The thickness of the iron will be 1⅛″. Then substituting in Formula 3, we have $D = \sqrt{\frac{31500 \times 25}{2 \times 100 \times 12 \times 1500 \times 1\frac{1}{8}}} = \sqrt{192} = 14''$. Hence we shall require a 12″ x 14″ girder.

Now for a comparison of the cost of the three girders we have considered in this example: the 14″ x 17″ hard-pine girder would contain 515 feet, board measure, which at five cents a foot would amount to $25.75. Two 12-inch iron beams 25 feet 8 inches long will weigh 2,083 pounds, and at four cents a pound they would cost $83.32. The flitch-plate girder would contain 364 feet, board measure, which would cost $18.20. The iron plate would weigh 1,312½ pounds, which would cost $52.50, making the total cost of the girder $70.70, or $13 less than the iron beams, and $45 more than the solid hard-pine beams.

Flitch-plate beams also possess the advantage that the wood almost entirely protects the iron, so that in case of a fire the heat would not probably affect the iron until the wooden beams were badly burned.

TRUSSED BEAMS.

Whenever we wish to support a floor upon girders, having a span of more than 30 feet, we must use either a trussed girder, a riveted iron-plate girder, or two or more iron beams. The cheapest and most convenient way is probably to use a large wooden girder and truss it, either as in Figures 2 and 4, or Figures 3 and 5.

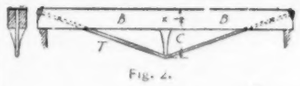


Fig. 2.

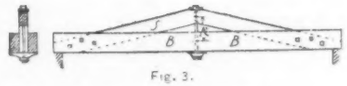


Fig. 3.

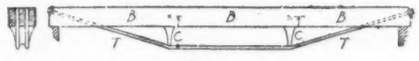


Fig. 4.

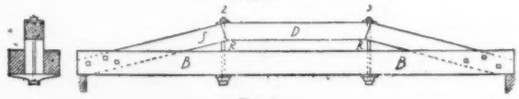


Fig. 5.

In the belly-rod truss, we either have two beams, and one rod, which runs up between them, at the ends, or three beams, and two rods running up between the beams in the same way. The beams if should be in one continuous length for the whole span of the girder they can be obtained of that length. The requisite dimensions of the tie-rod, struts, and beam in any given case must be determined by first finding the stresses which come upon these pieces, and then the area of cross-section required to resist these stresses. For a single-strut belly-rod truss such as is represented by Figure 2, the strain upon the pieces may be obtained by the following formulæ:

For distributed load W over whole girder: —

Tension in $T = \frac{3}{10}\ W \times \frac{\text{length of } T}{\text{length of } C}$. (5.)

Compression in $C = \frac{5}{8}\ W$.

Compression in $B = \frac{3}{10}\ W \times \frac{\text{length of } B}{\text{length of } C}$. (6.)

For concentrated load W over C: —

Tension in $T = \frac{W}{2} \times \frac{\text{length of } T}{\text{length of } C}$. (7.)

Compression in $C = W$.

Compression in $B = \frac{W}{2} \times \frac{\text{length of } B}{\text{length of } C}$. (8.)

For girder trussed as represented in Figure 3, under a distributed load W over whole girder: —

Compression in $S = \frac{3}{10}\ W \times \frac{\text{length of } S}{\text{length of } C}$. (9.)

Tension in $R = \frac{5}{8}\ W$.

Tension in $B = \frac{3}{10}\ W \times \frac{\text{length of } B}{\text{length of } C}$. (10.)

For concentrated load W at centre: —

Compression in $S = \frac{W}{2} \times \frac{\text{length of } S}{\text{length of } R}$. (11.)

Tension in $R = W$.

Tension in $B = \frac{W}{2} \times \frac{\text{length of } B}{\text{length of } C}$. (12.)

For double-strut belly-rod truss (Fig. 4) *with distributed load W over whole girder:* —

Tension in $T = .367\ W \times \frac{\text{length of } T}{\text{length of } C}$. (13.)

Compression in $C = .367\ W$.

$$\text{Compression in } B \text{ or } D = .367\ W \times \frac{\text{length of } B}{\text{length of } C}. \quad (14.)$$

For concentrated load W over each of the struts C: —

$$\text{Tension in } T = W \times \frac{\text{length of } T}{\text{length of } C}. \quad (15.)$$

Compression in $C = W$.

$$\text{Compression in } B \text{ or tension in } D = W \times \frac{\text{length of } B}{\text{length of } C}. \quad (16.)$$

For girder trussed as in Figure 5, under a distributed load W over whole girder: —

$$\text{Compression in } S = .367\ W \times \frac{\text{length of } S}{\text{length of } R}. \quad (17.)$$

Tension $R = .367\ W$.

$$\text{Tension in } B \text{ or compress'n in } D = .367\ W \times \frac{\text{length of } B}{\text{length of } R}. \quad (18.)$$

Under concentrated loads W applied at 2 and 3: —

$$\text{Compression in } S = W \times \frac{\text{length of } S}{\text{length of } B}. \quad (19.)$$

Tension in $R = W$.

$$\text{Tension in } B \text{ or compression in } D = W \times \frac{\text{length of } B}{\text{length of } R}. \quad (20.)$$

Trusses such as shown in Figures 4 and 5 should be divided so that the rods R, or the struts C, shall divide the length of the girder into three equal, or nearly equal, parts.

The lengths of the pieces, T, C, B, R, S, etc., should be measured on the centres of the pieces. Thus the length of R should be taken from the centre of the strut D to the centre of the tie-beam B; and the length of C should be measured from the centre of the rod, to the centre of the strut-beam B.

After determining the strains in the pieces by these formulæ, we may compute the area of the cross-sections, by the following rules:

$$\text{Area of cross-section of strut} = \frac{\text{Compression in strut}}{C}. \quad (21.)$$

$$\text{Diameter of iron tie-rod} = \sqrt{\frac{\text{Tension in rod}}{9425}}.^{1} \quad (22.)$$

For the beam B, we must compute its necessary area of cross-section as a tie, or strut (according to which truss we use), and also the area of cross-section required to support its load acting as a beam, and give a section to the beam equal to the sum of the two sections thus obtained.

$$\left.\begin{array}{l}\text{Area of cross-section of } B \text{ to}\\ \text{resist tension or compression.}\end{array}\right\} = \frac{\text{Tension}}{T} \text{ or } \frac{\text{Compression}}{C}. \quad (23.)$$

In trusses 2×3: —

$$\text{Breadth of } B \text{ (as a beam,)} = \frac{W \times L}{2 \times D^2 \times A}. \quad (24.)$$

In trusses 4×5: —

$$\text{Breadth of } B \text{ (as a beam,)} = \frac{W \times L}{\frac{5\ D^2 \times A}{2}}. \quad (25.)$$

In these formulæ: —

$C =$

1000	lbs.	per	square	inch	for hard-pine and oak.
800	"	"	"	"	" spruce.
700	"	"	"	"	" white-pine.
13000	"	"	"	"	" cast-iron.

$T =$

2000	lbs.	per	square	inch	for hard-pine.
1800	"	"	"	"	" spruce.
1500	"	"	"	"	" white-pine.
10000	"	"	"	"	" wrought-iron.

$A =$

120	lbs.	for	hard-pine.
100	"	"	spruce and oak.
80	"	"	white-pine.

EXAMPLES.

To illustrate the method of computing the dimensions of the parts of girders of this kind, we will take two examples:

I. — Computation for a girder such as is shown in Figure 2 for a span of 30 feet, the trusses to be 12 feet on centres, and carrying a floor for which we should allow 100 pounds per square foot. The girder will consist of two beams, and one rod. We can allow the belly-rod T to come two feet below the beams B, and we will assume that the depth of the beams B will be 12 inches; then the length of C (which is measured from the centres of the beams) would be 30 inches. The length of B would of course be 15 feet, and by computation, or by scaling, we find the length of T to be 15 feet $2\frac{1}{2}$ inches.

The total load on the girder equals the span multiplied by the distance of girders on centres, $\times$ 100 pounds $= 30 \times 12 \times 100 =$ 36000 pounds.

Then we find from formula (5)

$$\text{Tension in rod} = \tfrac{8}{10} \text{ of } 36000 \times \frac{182\frac{1}{2}''}{30''} = 65664 \text{ lbs.},$$

and from formula (22): —

$$\text{Diameter of rod} = \sqrt{\frac{65664}{9425}} = 2\tfrac{5}{8}'' \text{ nearly.}$$

The strut beams we will make of spruce. The compression in the two strut beams $= \frac{8}{10}$ of $36000 \times \frac{180}{30} = 64800$ pounds or 32400 pounds for each strut. To resist this compression would require $\frac{32400}{800} = 40$ square inches of cross-section, which corresponds to a beam $3\frac{1}{3}''$ x $12''$. The load on B = one-half of $36000 = 18000$ pounds, and as there are two beams, this gives but 9000 pounds load on each beam.

Then from formula (24)

$$B = \frac{9000 \times 15}{2 \times 144 \times 100} = 4\tfrac{2}{3}''$$

and adding to this the $3\frac{1}{3}''$ already obtained for compression, we have for strut-beams, two $8''$ x $12''$ spruce beams. The load on $C = \frac{5}{8}\ W = 22500$ pounds. If we are to have a number of trusses all alike, it would be well to have a strut of cast-iron, but if we are to build but one, we might make the strut of oak. If of cast-iron, the strut should have $\frac{22500}{13000} = 1.8$ square inches of cross-section at its smallest section, or about $1''$ x $2''$. If of oak it would require a section $= \frac{22500}{1000} = 22\frac{1}{2}$ square inches $= 4\frac{1}{2}''$ x $5''$ at its smallest section. Thus we have found that for our truss, we shall require two strut-beams $8''$ x $12''$ of spruce about 31 feet long, a belly-rod $2\frac{5}{8}''$ diameter, and a cast-iron strut $1''$ x $2''$ at its smallest end, or else an oak strut $4\frac{1}{2}''$ x $5''$.

Example II. — It is desired to support a floor over a lecture-room 40 feet wide, by means of a trussed girder, and as the room above is to be used for electrical purposes it is desired to have a truss with very little iron in it, and so we use a truss such as is shown in Figure 5. Where the girders rest on the wall, there will be brick pilasters, having a projection of 6 inches, which will make the span of the truss 39 feet, and we will space the rods R, so as to divide the tie-beam into three equal spans of 13 feet each. The tie-beam will consist of two hard-pine beams, with the struts coming between them. We will have two rods, instead of one, at R, coming down each side of the strut, and passing through an iron casting below the beams, forming supports for them. The height of truss from centre to centre of timbers we must limit to 18 inches, and we will space the trusses 8 feet on centres. Then the total floor area supported by one girder equals $8' \times 39' = 312$ square feet. The heaviest load to which the floor will be subjected will be the weight of students, for which 75 pounds per square foot will be ample allowance, and the weight of the floor itself will be about 25 pounds, so that the total weight of the floor and load will be 100 pounds per square foot. This makes the total weight liable to come on one girder 31,200 pounds.

Then we find from formulæ (17 and 18): —

$$\text{Compression in struts} = .367\ W \times \frac{157''}{18''} = 106800 \text{ lbs.}$$

$$\text{Tension in both tie-beams} = .367\ W \times \frac{156''}{18''} = 106000 \text{ lbs.}$$

$$\text{Tension in both rods } R = .367\ W = 11450 \text{ lbs.}$$

The timber in the truss will be hard-pine, and hence we must have, $\frac{106800}{1000} = 107$ square inches area of cross-section in the strut, which is equivalent to a $9''$ x $12''$ timber, or, as that is not a merchantable size, we will use a $10''$ x $12''$ strut. The tie-beams will each have to carry one-half of $106000 = 53000$ pounds, and the area of cross-section to resist this $= \frac{53000}{2000} = 27''$ or $2\frac{1}{4}''$ x $12''$.

The distributed load on one section of each tie-beam, coming from the floor-joist $= 13 \times 8 \times 100 = 10400$ pounds, and from Formula 25 we have $B = \frac{W \times L}{5\text{-}2\ D^2 \times A} = \frac{10400 \times 13}{5\text{-}2\ 144 \times 120} = 3\frac{1}{8}''$.

Then the breadth of each tie-beam must be $3\frac{1}{8}'' + 2\frac{1}{4}'' = 5\frac{3}{8}''$ or say, $6,''$ hence the tie-beams will be $6''$ x $12.''$ Each rod will have to carry 5725 pounds and their diameter will be $\sqrt{\frac{5725}{9425}} = \frac{3}{4}''$ nearly.

Thus we have found for the dimensions of the various pieces of the girder: —

Two tie-beams $6''$ x $12.''$ Two rods at each joint $\frac{3}{4}''$ in diameter, and strut-pieces $10''$ x $12.''$

[1] Allowing 12000 lbs. to be tension per square inch in the rod.

BUILDING SUPERINTENDENCE. — XXX.

WE need dwell no more upon the details of construction of our building, which would now differ little from those of any other, but will proceed at once to consider the necessary means for heating and ventilating the various rooms. Success in this point will be a matter of some difficulty, and we should have our scheme well prepared in advance, in order that the necessary distribution of flues and pipes may be effected to the best advantage.

Heating and Ventilation.

The only practicable method of conveying heat from a single source to all points of so large a building is to employ steam, and although steam-heating is in many respects inferior to that by means of hot water or ordinary furnaces, we have no alternative, and must try to mitigate the bad features of the system as much as possible. For the smaller rooms, the evil to be avoided is the closeness, from want of a fresh-air supply, which generally characterizes steam-heated offices, and to remedy this we shall do best to adopt what is known as the direct-indirect mode of heating, in which the radiators stand in the rooms, but are made to enclose a space into which air is admitted directly from the outside of the building, to pass, after being warmed by contact with the pipes of the radiator, into the room. The large hall in the second story must be heated in a somewhat different way, since it would not be possible to place radiators in the interior of the room, but it will be advantageous to keep them as near the part to be warmed as possible. The source

Steam.

Direct-Indirect Method.

of heat for the entire building will be a boiler placed in the basement, and we should get some notion of the necessary size of the boiler, and of the flue to carry off the smoke from it, in time to proportion the rooms suitably.

We can form a rough estimate of the radiating surface required, and thence of the sizes of pipes, boilers and flues, by allowing one-tenth of a square foot radiating surface to each square foot of plain wall and exposed roof surface, and seven-tenths of a square foot of radiating surface additional for each square foot of glass in the windows. The building has about 33,000 square feet of outside wall and 15,000 square feet of interior wall, and to this must be added 12,000 square feet of roof surface, exposed to the interior of the rooms, making 60,000 square feet of roof and wall, requiring 6,000 square feet of radiating surface. Of glass in the various openings there is about 5,600 square feet, seven-tenths of which will give 3,920 feet additional of radiating surface, making 9,920 square feet in all. The rule sometimes used, of allowing for direct-indirect radiation one and a half square feet of radiating surface for every 100 cubic feet of space contained in the building, would give, as we have about 900,000 cubic feet, 13,500 square feet of radiating surface; but this would be an excessive allowance for the large hall in the second story, and our first estimate is quite safe.

Estimate of Radiating Surface required.

By the usual rule for estimating, the heating surface of the boiler must be one-tenth that of the radiating surfaces, which would give here 992 square feet. This could be obtained by using a horizontal boiler 5 feet in diameter and 20 feet long, with about 60 tubes, but a single boiler of this kind would not work to such advantage as two, presenting together the same amount of heating surface; and there is here the further advantage in using two boilers, that one can be employed solely for heating the hall in the upper story, which is only occasionally in use, while the other can be devoted independently to warming the offices in the first story and basement of the building, which are occupied almost continuously. We must therefore make a new calculation, which shows us that the hall in the second story will require almost exactly one-half of the total radiating surface, so that two boilers just alike, each containing 500 square feet of heating surface will answer admirably. As an engineer will be constantly employed, it will be most convenient and economical to use two horizontal boilers, each 4 feet in diameter, 20 feet long, and containing 30 tubes. Each of these boilers will need, in order to be able to get up steam quickly, about 20 square feet of grate surface, and we shall require, to carry away the gases of combustion quickly from these grates, when both are in operation, a chimney of the best form with a sectional area of about 13 square inches to each square foot of grate surface. We have 40 square feet of grate surface, and must have, therefore, 520 square inches of sectional area of chimney. The height of the chimney would enter into the calculation to a certain extent, since the velocity of the current increases with the height of the heated column, but this advantage is soon lost in prolonging the shaft to an excessive height, and we shall obtain the best results by assuming only the average dimensions. The sectional area thus calculated should be obtained in a square or circular flue, as an oblong one, with the same area, has much less capacity for carrying away smoke. Considering the circumstances of our building, it will be found most advantageous to employ a circular cast-iron smoke-pipe, and to place it in the ventilating shaft which forms a portion of the tower, so that the heat radiated from it may assist the upward current in the ventilating flue. A pipe 28 inches in diameter will give the requisite sectional area, or a little more; and as it will be 128 feet in height we can be sure of a good velocity in it. The only objection to such a position for the chimney is the danger of disfiguring the upper portion of the tower with smoke; but by carrying the pipe through the roof of the smaller turret it will discharge the smoke at a sufficient distance from the main belfry to make sure that it will be carried away by the wind.

Necessary Heating Surface of Boiler.

Grate Surface.

Necessary Size of Chimney.

Shape of Flue.

The position of the boilers will be determined in general by that of the chimney, since it is desirable that the communication between the smoke connection of the boilers and the chimney should be as direct as possible, avoiding long pipes, which chill the gases, and underground flues, in which it is difficult to start a current. Fortunately, we have kept this point in view, and have arranged a room in the corner of the basement, close to the tower, large enough, not only for placing and managing the boilers, but for passing all around and over them, with sufficient space in front of them for handling the long flue-brushes and scrapers which will be required.

Position of Boilers.

We may now estimate roughly the size of the largest pipes which will be required, and we shall then know what special provision must be made in the construction of the building for placing them. Taking the safe rule that the main distributing pipes should have a sectional area equivalent to eight-tenths of a square inch for each 100 square feet of radiating surface supplied by them, we shall find, since each boiler furnishes steam to 4960 square feet of radiating surface, that each main steam-pipe must be a little more than 7 inches in diameter inside. As no pipe is made between 7 and 8 inch, and as 8 inch is much larger than would be necessary, we will determine upon 7-inch pipe. The risers, or pipes which run up to supply the radiators above will be small, none being more than 3 inches in diameter, and we shall have no difficulty in carrying them up in 4″ x 4″ recesses left in the wall at the proper places, which it will be well to mark on the plans at once.

Size of Main Pipes.

Before this can be done, however, we must determine all the main features of our system of ventilation as well as heating, and the sooner we make up our minds about this the better.

For the basement and first story rooms the plan of ventilation should be as simple as possible. Fresh air will be admitted behind the radiators in each room, which should stand under the windows, in order that the warmth from them may counteract the descending stream of cold air which, in winter, always flows over the surface of the glass, and foul air will best be taken out at two points, one near the top and the other near the bottom of the room. For the offices which have fireplaces, the opening of this will form the lower outlet, but another should be provided near the ceiling, communicating with a flue which may be carried up beside the fireplace flue. Where there is no fireplace, two flues, one opening near the floor, and the other near the ceiling, will be necessary. If the combined area of these outlets is made somewhat greater than that of the inlet, a gentle current will be maintained at all levels in the room, and the air kept in better condition than would be possible with a single outlet. As the small rooms are occupied only by a few officers and clerks, the supply of fresh air need not be very large, and a 4-inch round pipe to each radiator would make an ample inlet. For outlets, brick flues 8″ x 12″ will be best, and each flue may open with small registers both in basement and first story, remembering, however, that two openings must not be made in any flue in the same story, and that a flue which exhausts from the floor of the basement rooms must also, if it opens in the second story, exhaust from the floor there also, and that in the same way the ceiling registers in the first-story rooms should open into the flue which draws from the ceiling of the basement rooms. It need hardly be said that two fireplaces should not under any circumstances open into the same flue, and that the outlet registers in the basement rooms must not have a clear opening greater than half the sectional area of the flues into which they open, if any air is to be drawn into the same flues from the rooms above.

First-story Ventilation.

As the entrance-way and corridor in the first story and basement will naturally be more or less foul, a good current of air should at all times be maintained through them. The frequent opening of the doors will furnish a sufficient fresh-air supply, without bringing special pipes to the radiators, and it will be of advantage to restrict the inlets, but increase the outlet, encouraging the exhaust in other ways as much as possible, so that the draft from the corridor will be stronger than that in the rooms, and the current will, on opening the doors, tend consequently from the room into the corridor, and not *vice versa*. We will therefore provide only direct radiation for warming the corridors, and will conduct the air from them by a pipe passing through the closets at the end opposite the staircase to the gable wall, where a large flue is ready to receive it and carry it away. If there should be any difficulty in maintaining a current through this flue in cold weather, we can afterwards place a radiator in it, a little above the level of the second-story floor; but this wall is of great thickness, and we can easily build in it a flue 20″ x 20″, or 20″ x 24″, perfectly straight, and 100 feet high, which will be very little liable to a reversal of the current in it, even without artificial heating.

Having now provided for the separate removal of the air in the basement and first story, which we wish to prevent from ascending the stairs to annoy the occupants of the hall above, we must arrange for a special supply to the latter. The hall, with the gallery, will seat about 1000 persons, and to make them quite comfortable during an evening they should be furnished with at least 1500 cubic feet each of fresh air per hour; and this air must, moreover, be warmed in winter before delivery, and conducted throughout the room gently and uniformly, leaving no corner unvisited, and dispersing itself everywhere rapidly but without sensible currents. The system must include every part of the room, since any portion unswept by the flow of air will become a reservoir of decaying organic particles, which will diffuse themselves through the neighboring atmosphere for some distance in all directions. We will at first consider the winter ventilation only, that for summer being simpler, but completely different.

Ventilating Main Hall.

As in the rooms below, we have decided to use the direct-indirect method of steam heating in the hall, placing large radiators under the windows on all sides, and supplying each radiator with a given quantity of fresh air from the outside, to be warmed by contact with it, and then delivered into the room. The persons seated next the walls, who would otherwise be exposed to the chilling currents which descend along the surface of the windows, and to a much smaller extent along the plastering, will then be doubly protected, by the deflection of the cold currents on meeting the warm streams rising from the radiators, and by the direct influence of the warm rays falling upon their bodies from the hot pipes. As those occupying the seats at the edges of the room will thus be warmed by direct radiation, the air supplied to them need not be so warm as if it were the only source of heat; and the current delivered from the radiators, if sufficiently abundant, need not be raised above 60° Fahrenheit. This will answer also for the persons in the interior of the room, who, although cut off in part from the heat radiated by the steam coils, are less exposed to cold currents from the windows, and receive, moreover, a very considerable amount of warmth radiated from the bodies

of those around them. With this human warmth, however, is given off a certain amount of organic exhalation, so that the air in the centre of the room will be less pure than that nearer the fresh-air openings at the sides, and it will be necessary to furnish the middle portions with an additional supply. In many buildings this could be done by placing registers in the aisles between the seats, introducing at small intervals air taken fresh from the outside, warmed in the basement and sent up through pipes, but we have to bear in mind that our hall will often be used for dancing, so that registers in any part of the floor will be quite inadmissible, and some other place must be found for delivering the air.

There are but two other positions where inlets can be placed near the floor, one of these being the vertical front of the stage and the other the front of the gallery. Both of these will do, and we will arrange to use them, although in different ways. The front of the stage being separated, sometimes by an orchestra, sometimes merely by an open space, from the front rows of seats, may be used as a great register, throwing in air along its whole extent, and the air so introduced will, in its passage across the orchestra space, diffuse and mix itself with other currents, thereby losing its original impetus, and reaching the occupants of the front benches as a breeze so gentle as to be hardly felt. This stage front will, in fact, offer the best position in the room for the advantageous introduction of air, and we must arrange for taking it by ample openings from the outside into the space under the stage, and for warming it by radiators before delivering it into the auditorium. Some of the radiators may be placed close to the open gratings of the front, where their direct warmth will be felt by the persons nearest them, who are most exposed to the current.

By taking advantage of the shape of the space under the stage, we shall be able to secure a gentle but strong horizontal delivery of the warmed air, which will send it well toward the centre of the room before it begins to ascend, and the portion of the auditorium nearest the stage will thus be supplied with fresh air throughout its whole extent. For the remaining half we will take fresh air from the rear wall, under the front of the gallery, but in a manner slightly different from that employed for the first portion. In order to throw the supply from this direction well into the centre of the auditorium, we shall need to bring it in with considerable velocity, and as the seats for the audience extend to a point within a few feet of the gallery front, the current, if allowed to strike the persons sitting in them, would be felt as a disagreeable and even dangerous draught, so that we shall do best to introduce the greater part of it at a height of ten or twelve feet above the ground. In this way the main current will pass above the heads of those sitting near the inlet registers, the air diffusing itself so as to come within reach of the lungs of the audience only in proportion as it loses velocity. Under this arrangement, the greater the force with which it enters the room the more effective will the stream be in reaching and stirring up the atmosphere of the middle portions, and we may with advantage place the radiators for heating it in the basement, and bring the air up by pipes through the offices in the basement and first story. By making the pipes straight, with a curved elbow at the top to direct the current into the room, we shall obtain a heated column long enough to possess a very considerable buoyant tendency, and the air will be thrown into the hall with force enough to carry it to the centre before it will begin to rise. To complete the supply of fresh air for the room, we must furnish the occupants of the rear rows, who will receive little benefit from the currents passing over their heads, with some separate inlets near the floor, bringing the air in through exposed steam coils in the direct-indirect manner, so that, as at the sides of the room, the chill caused to the persons near by the movement of the incoming air, which, slight as it is, increases the evaporation from the skin, and causes a sensation of cold; together with the loss of heat due to radiation from the body to the cold walls, and the unpleasant draughts due to accidental currents, may be compensated by the warm rays from the pipes.

We shall now have, for the main portion of the auditorium, currents of fresh air proceeding from all sides, and meeting in the centre. The currents from front and rear are purposely directed with considerable force in a horizontal direction, and those from the sides, which are, so to speak, pressed upon by the descending cold air from the window surfaces, will be deflected in the same direction, and this impulse, aided by the natural adhesion of moving air to the surfaces with which it comes in contact, will serve to keep at least the heads of the occupants of the room in a pure and constantly renewed atmosphere. On the meeting of the currents in the middle, their horizontal movement will be destroyed, and the buoyant force due to the heat of the mass of air, which has grown warmer in passing among the bodies of the people, will assert itself, carrying the whole upward. Then, if not otherwise disposed of, it will become chilled by contact with the underside of the cold roof, and will descend along the surfaces of the roof, walls and windows, to mingle again with the incoming air from the radiators, and repeat the same round. This would not only contaminate the freshness of the new supply, but would very much reduce its amount, since air cannot be forced by ordinary means into a room which is full already, so that we must, to secure a continuance of the flow of pure air, remove the vitiated atmosphere before it can descend to the level of the incoming currents.

If the movement of the air were positive enough to carry it, after rising above the heads of the people, directly to the roof, it might be best to take it from the ridge, but in cold weather this would hardly be the case, much of the air becoming chilled and returning downward before reaching that point, so that we shall do better to exhaust it from the level of the cornice, a little above the line of separation between the lower, fresh, warm and horizontally moving stratum, and the upper stratum of vitiated, gradually-cooling and descending air. If the hall were of a perfectly simple shape, this upper stratum would move uniformly all around, but there are two causes which will give it a tendency toward the stage end of the room. One of these is the attraction of the stage ventilation, which draws the upper air sensibly toward the proscenium-arch; and the other is the pressure of the air from the gallery, which, introduced through radiators at the sides and rear, will move forward into the main body of the auditorium, pushing the stratum in front of it in the same direction. The mass of air which we wish to remove will then be impelled gently against the proscenium wall, and can be removed most effectively by openings in that wall, through which it can continue its course into the ventilation-shaft and away from the building. These openings can have any decorative shape, and should communicate with a conduit behind the proscenium wall, carried into the main ventilating flue.

THE ILLUSTRATIONS.

COMPETITIVE DESIGNS FOR $3,000-HOUSES SUBMITTED BY "*Crescent Moon*" AND BY "*Comfort*" [NO. 2].

SHOULD any of our non-professional readers desire to build according to either of these designs, we trust he will do the author the simple justice of putting the work into his hands. We shall always be pleased to put client and author into communication with each other.

HOUSE FOR H. C. G. BALS, ESQ., INDIANAPOLIS, IND. MESSRS. J. H. & A. H. STEM, ARCHITECTS, INDIANAPOLIS, IND.

THE first story is of stone, and the second story is covered with red tile. The house cost $15,000.

DESIGN FOR A RECEIVING TOMB. MR. C. B. ATWOOD, ARCHITECT, NEW YORK, N. Y.

THE $3,000-HOUSE COMPETITION. — XIII.

SPECIFICATION FOR DESIGN SUBMITTED BY "*Comfort*" (NO. 2).

CARPENTRY.—Frame of spruce. Sill and plate, 4″ x 6″; studs, 2″ x 4″ and 2″ x 3″. Floor joists, 2″ x 8″; rafters, 2″ x 7″. Floors bridged every 7′. Covering-boards, square-edged, hemlock. Outside finish of pine. Flashings of zinc. Under floors of hemlock. Upper floors, hard-pine in Kitchen; elsewhere, spruce, planed smooth. Inside finish, pine to paint. Doors and sashes, first quality factory. Doors of first story to have plain glass knobs and japanned butts; elsewhere to have mineral knobs. Blinds to all windows. Shelves in closets, pantry and china-closet. Front stairs, first flight, ash, others of pine.

Masonry: — Cellar wall, rubble-stone laid dry and pointed. Fireplaces, face-brick laid in red mortar, with tile hearths. Chimneys, piers and underpinning of common bricks laid in lime-mortar.

Painting:—Outside, two coats of white-lead and oil. Inside, one coat of shellac and two coats of paint.

Plastering: — Spruce laths, and two-coat work.

Plumbing: — Long hopper water-closet; soapstone sink in Kitchen and force-pump.

ESTIMATE OF QUANTITIES AND PRICES RULING NEAR BOSTON, MASS.

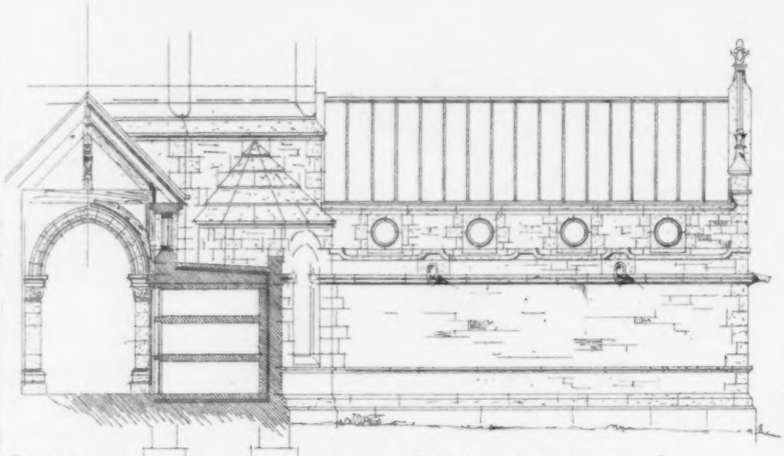
CARPENTRY.

10,000 feet spruce timber, @ $17	$170.00
5,000 feet " partition and furring stock, @ $16	80.00
8,000 feet hemlock under floor and covering boards, @ $15	120.00
37 M. pine shingles, @ $3.50	129.50
1,000 feet stock for outside finish	35.00
100 feet pine gutters	12.00
33 windows complete, frame, sash, glass, and blinds, @ $5	165.00
22 doors and frames, @ $3	66.00
Outside door, @ $15	15.00
Front porch	25.00
Inside finish	200.00
2,500 feet upper floors, @ 2½c	62.50
250 feet hard-pine kitchen floor, @ 5c	12.50
Stairs	90.00
Hardware and nails	150.00
Mill-work, carting and sundries	100.00
Labor	600.00
Mantels and buffet	50.00

MASONRY.

17 squares excavating, @ $2.50	$42.5
50 perch cellar stone, laid, @ $2.50	125.0
10,000 bricks, laid, @ $18	180.0
8 thimbles	4.0
900 yards plastering, @ 25c	225.0
2 fireplaces	40.0
Painting, not including glazing	175.0

COPYRIGHTED 1918 JAMES R. OSG

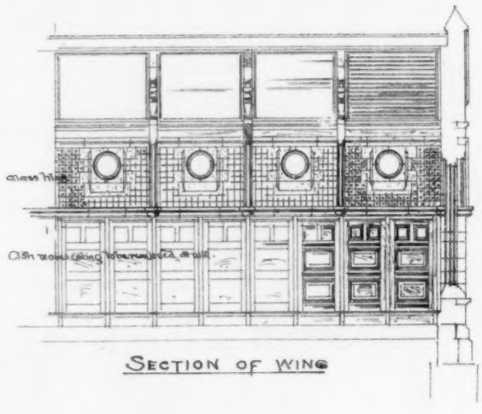


SECTION OF WING.

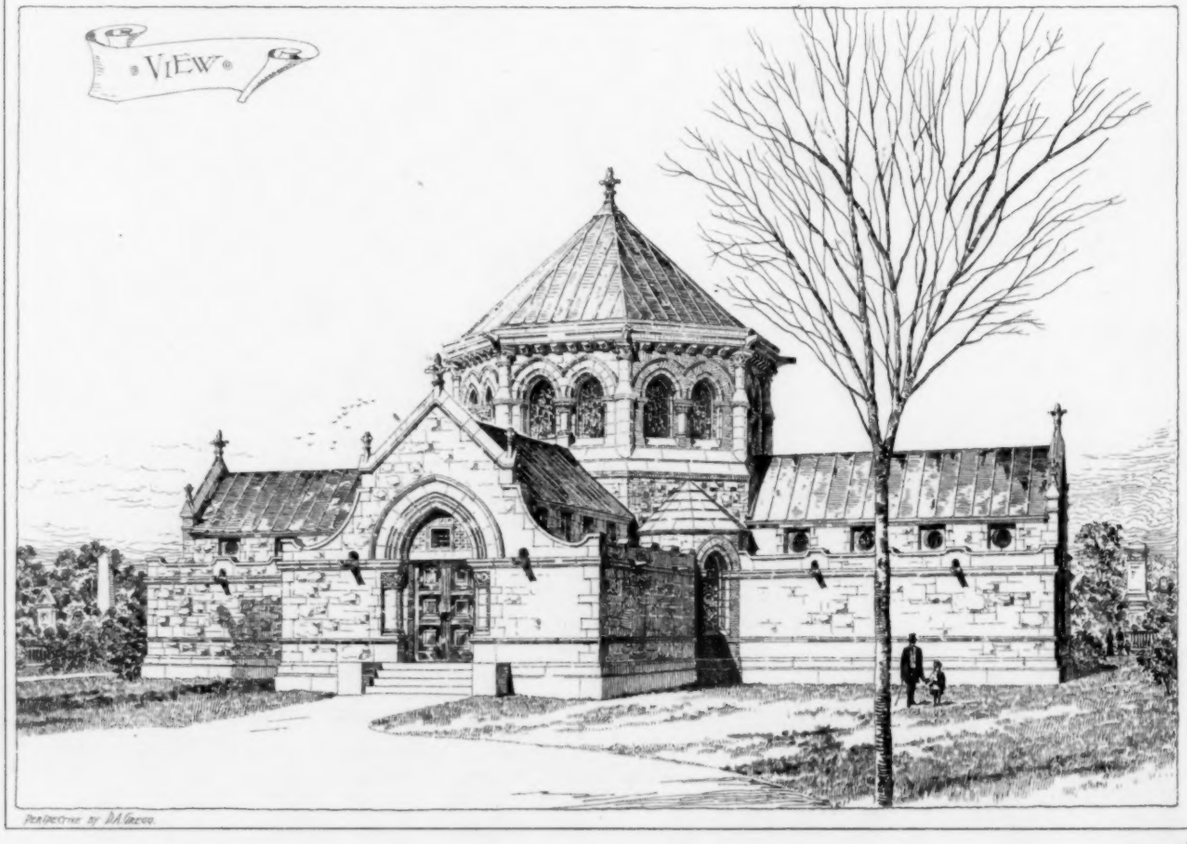
SIDE VIEW OF WING

END VIEW OF WING

ELEVATION OF DOORWAY.



SECTION OF WING



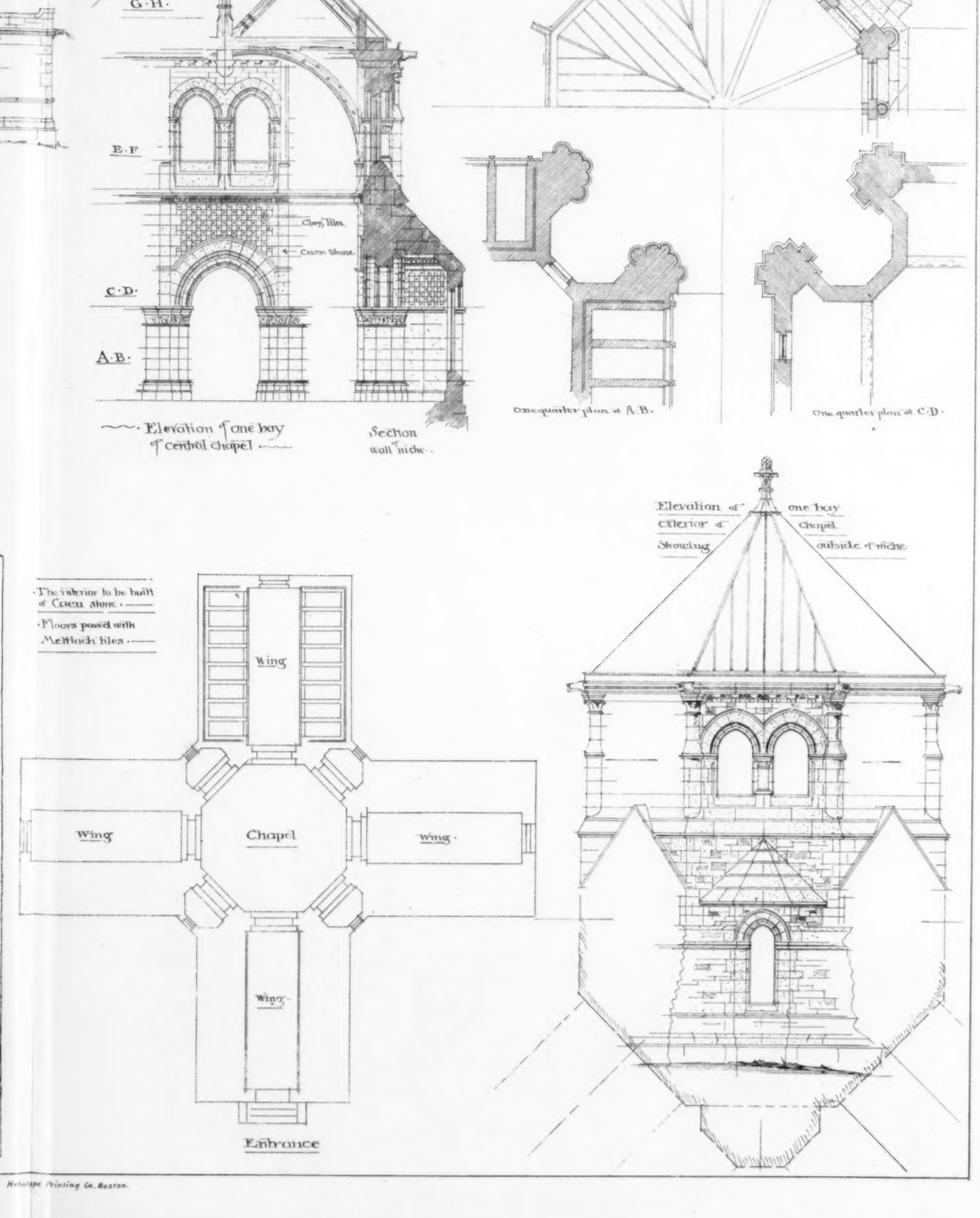
PERSPECTIVE BY D.A. GREGG

Heliotype Printing

PRINTED BY JAMES R. OSGOOD & CO.

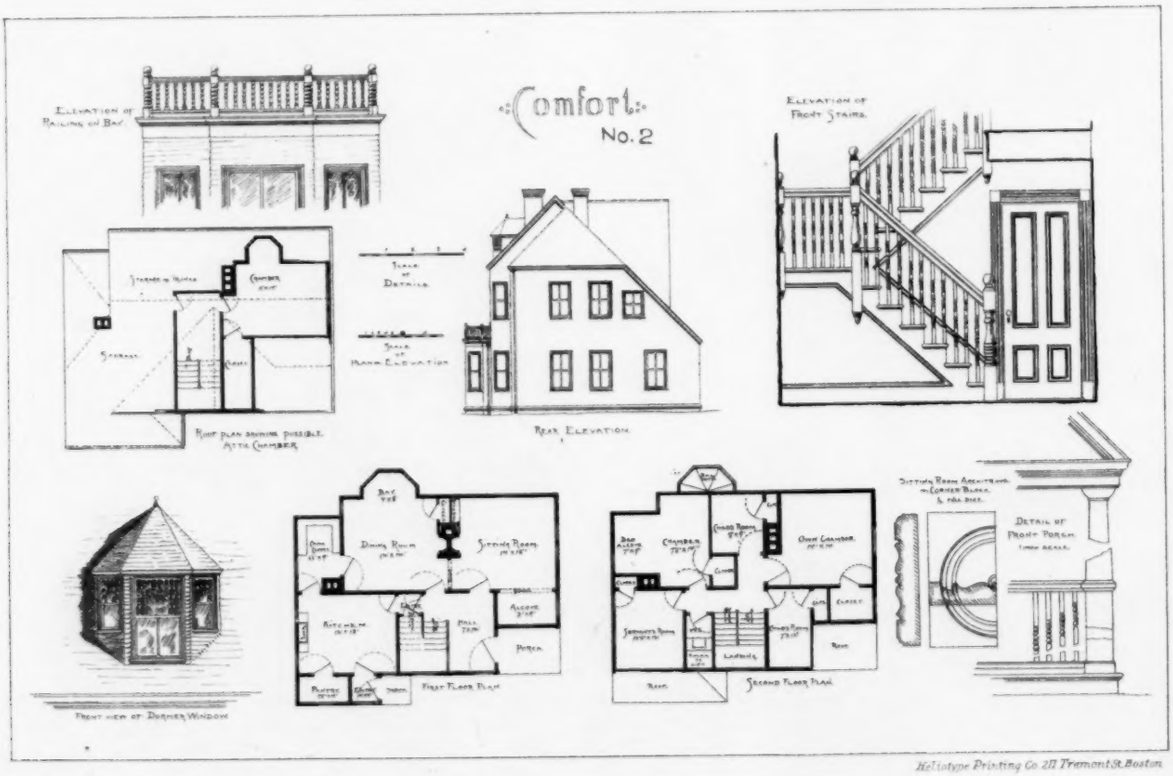
Design for a Receiving Vault for a Cemetery

Chas. B. Atwood, Architect, New York.



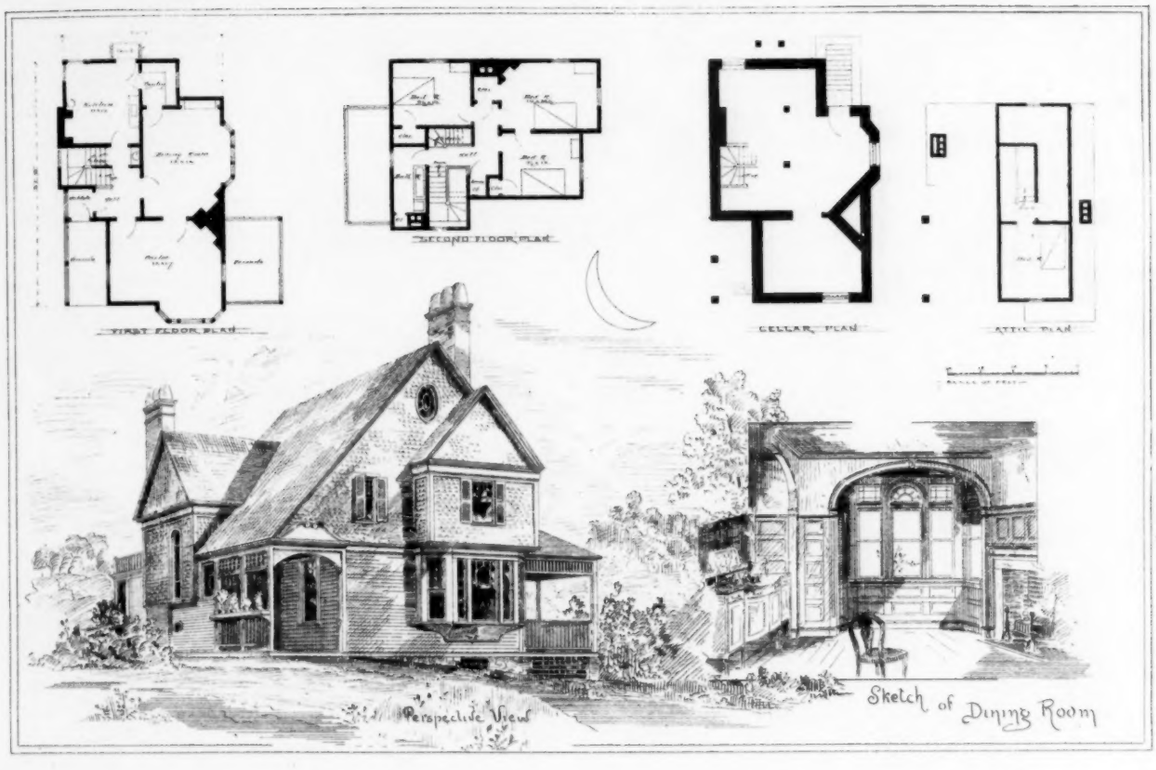
Heliotype Printing Co. Boston.

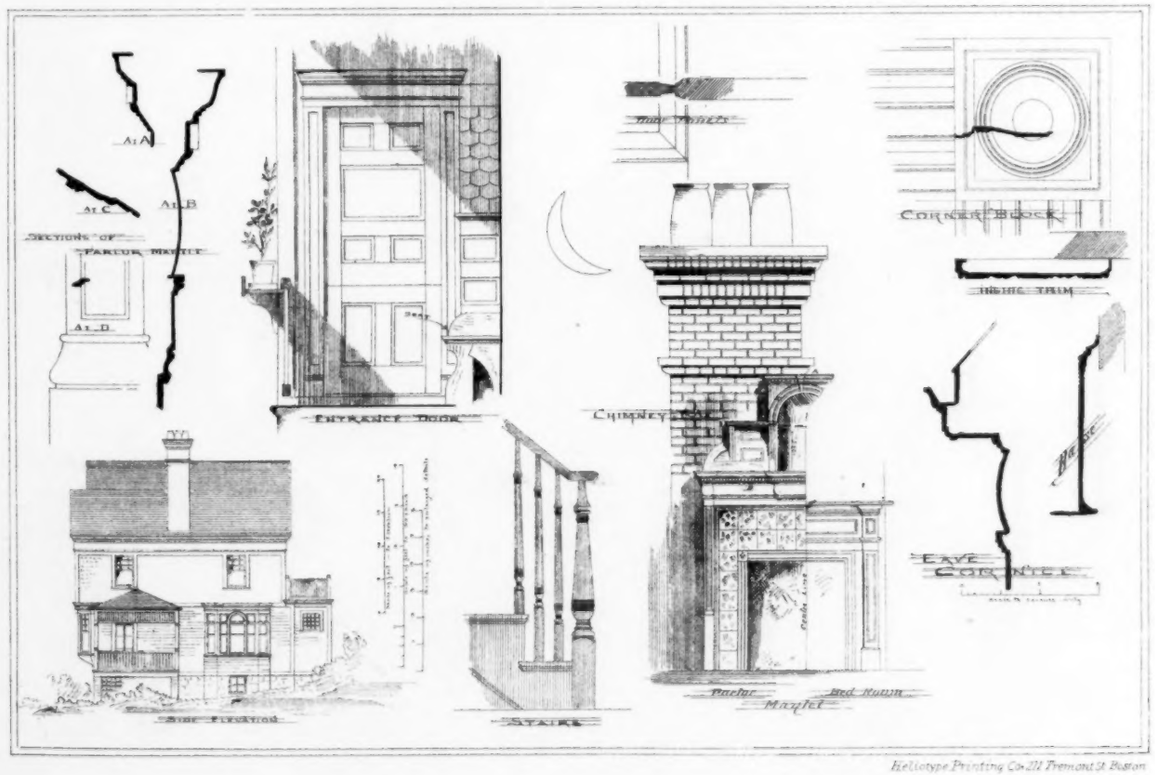
COPYRIGHTED 1883, JAMES R. OSGOOD & CO.



Heliotype Printing Co. 211 Tremont St. Boston.

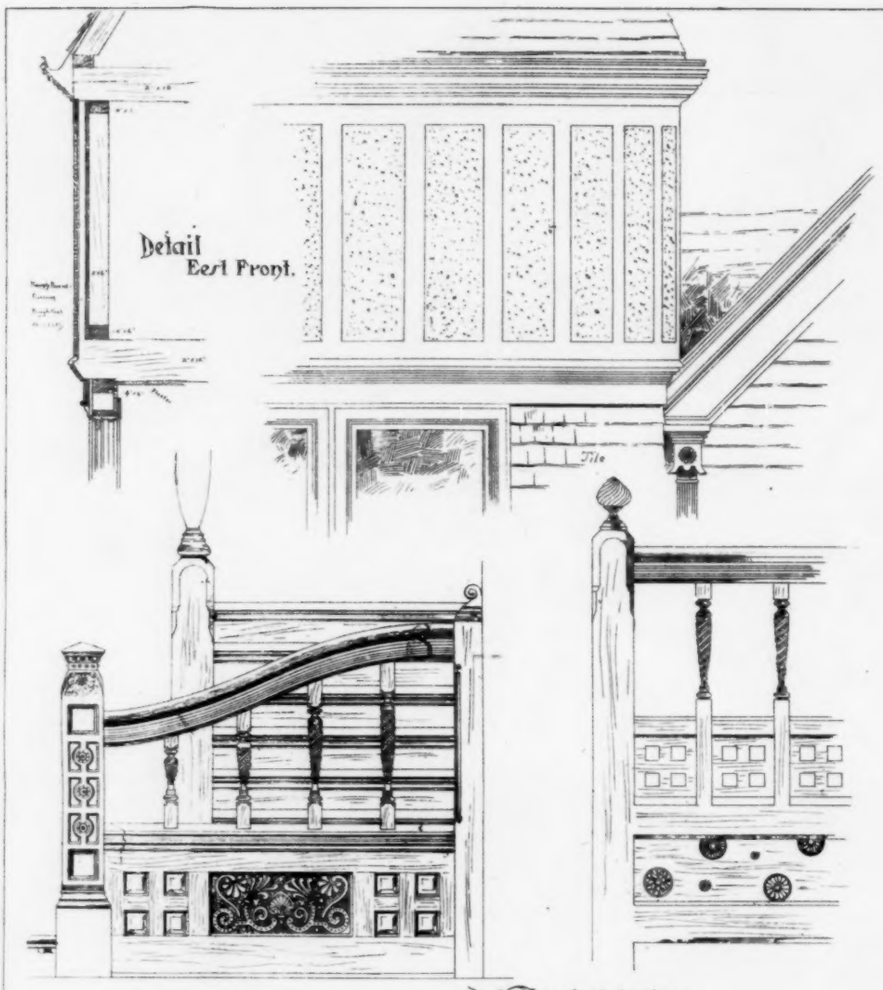
COPYRIGHTED 1883 JAMES R. OSGOOD & CO.



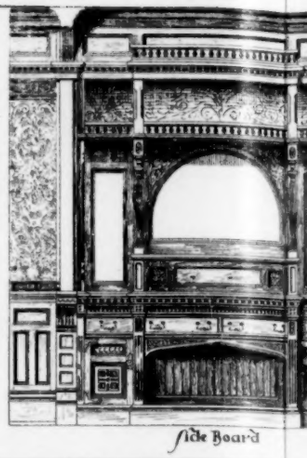


Heliotype Printing Co. 211 Tremont St. Boston.

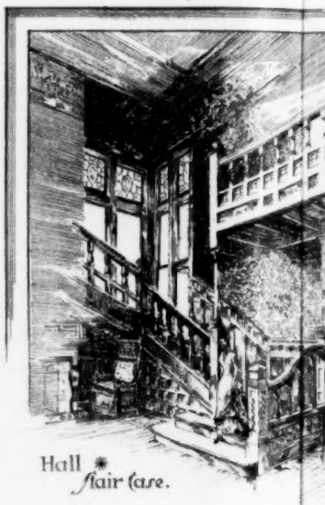
COPYRIGHTED 1[illegible]



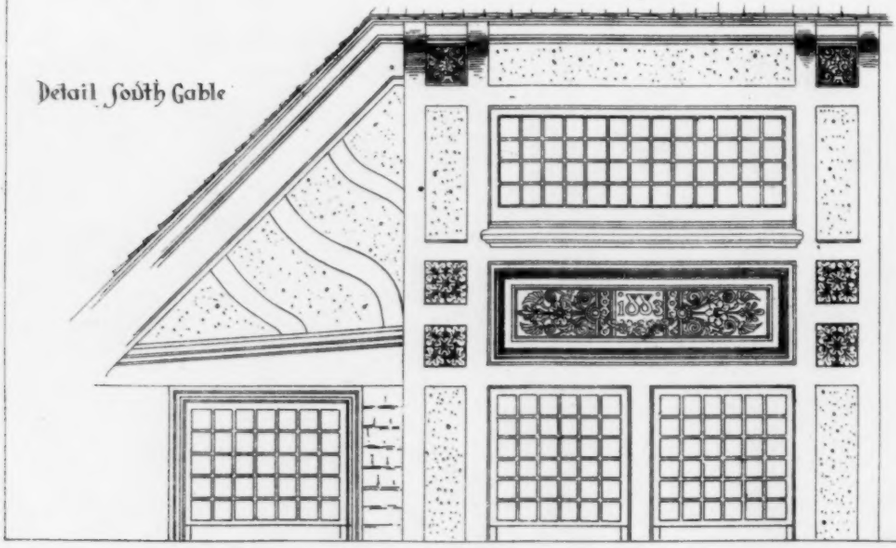
Details of Stair Case.

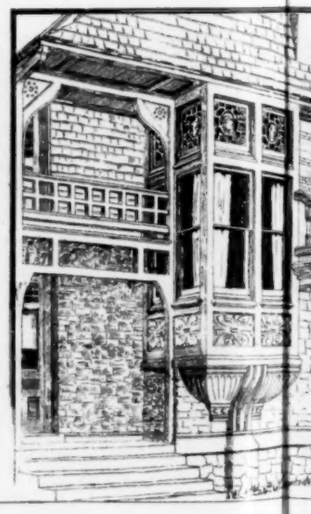


Side Board



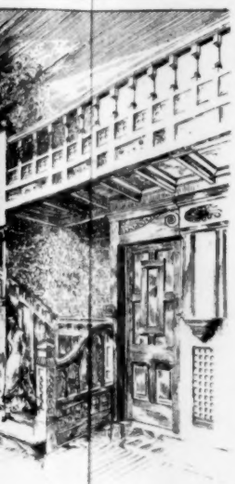
Hall Stair Case.



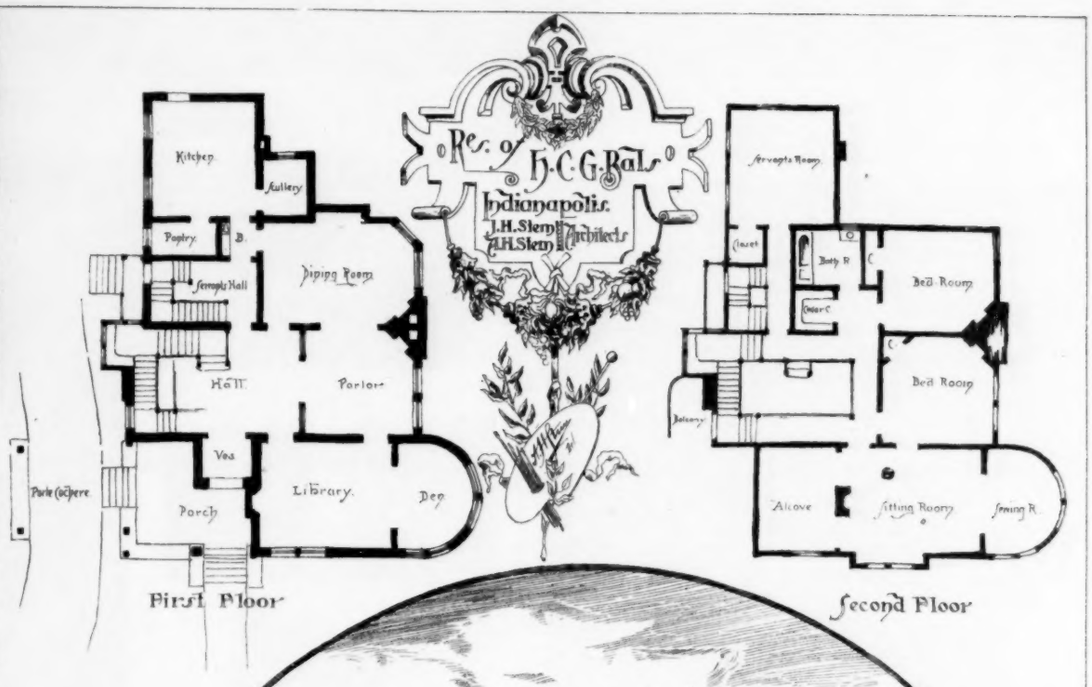


PRINGHELLER ... MARCY M. BIGELOW & CO

...le Board



Sketch of West Front



Heliotype Printing Co. 211 Tremont St. Boston.

COPYRIGHTED 1882, JAMES R. OSGOOD & CO

Section of Frieze in Private Residence, Ithaca, N.Y. Drawing Room.

A few new designs.

Section of Wall, Private Residence, Chicago, Ill.
Smoking Room.

Section, Dado, Private Residence
New York City

Heliotype Printing Co. 211 Tremont St. Boston

COPYRIGHT J. & J. G. LOW. 1881. 1882. 1883

C. A. WELLINGTON & Co
44 Boylston St. Boston

AMERICAN ART-INDUSTRIES. No. 1.
LOW'S "ART TILES" AND "PLASTIC SKETCHES".

Conductors, 100 feet, 2½-inch zinc	$15.00
Plumbing	70.00
Total	$2,959.00
Architect's commission, 3½ %	103.56
	$3,062.56

SPECIFICATION FOR DESIGN SUBMITTED BY "*Crescent Moon.*"

All the work and materials to be warranted good quality.

Excavation:—The entire cellar to be excavated.

Stone-Work:—Basement walls to be of stone 18" thick, laid in mortar and neatly pointed.

Brickwork: — The chimneys to be hard-burned brick.

Lath and Plaster: — The entire first and second stories, and one room and hall in attic to be lathed and plastered.

Fireplaces: — The Parlor fireplaces to have tile hearth and facing, with cast-iron back; the Dining-room and second story will have brick hearth, back and facings.

Cistern:— Build brick cistern 8′ diameter and 8′ deep, properly cemented and made water-tight; same to have brick dome and tile drain connected with tin leaders.

CARPENTER'S WORK.

Size of Timbers:—Floor beams, 2″ x 8″; posts, 4″ x 6″; interties, 4″ x 6″; plates, 3″ x 6″; sills, 4″ x 8″; rafters, 2″ x 6″; valley rafters, 2″ x 9″; ridge pieces, 2″ x 8″.

Bridging:—All floors to have one row of cross-bridging.

Roofs:—All cornices to be moulded, and have gutters and valleys properly tinned; roofs to be of shingles laid on slats; the gutters will have tin leaders to connect with rain-water drains; the one-story portion, Dining-room, bay-window and alcove will have roofs of tin.

Siding: — The frame to be covered with hemlock boards, and lined with heavy building paper; the first story will then be covered with clapboards; the second story and gables with shingles: verandas will have matched ceilings of pine.

Floors:—All inside floors to be of spruce, 5″ wide; porch floors, pine.

Windows:—All windows will have double-hung sliding sash, glazed with single-thick French sheet-glass; bay-windows will have inside Venetian blinds; other windows, outside rolling blinds.

Doors:—All inside doors to be 1½″ thick, and have moulded panels; outside door, as shown on detail drawing, 1¾″ thick; all to be hung with butts, and have mortise-locks with porcelain furniture.

Trimming: — The whole of the trimming will be of pine, with reeded mouldings; the door and window to finish with corner and base blocks.

Stairs: — Stairs to be of pine, with ash newels, rails and balusters, as shown on detail drawings.

Pantries and Closets:—All to be fitted up with hanging hooks, and three shelves, as directed.

Wainscoting:—The Dining-room will be wainscoted as shown on interior sketch.

Mantels.—Fit up mantels as shown on detail drawings; the one in second story will be of pine; those in first story will be of ash.

Tank:—Fit up tank in attic, 3′ x 4′ and 3′ deep.

Miscellaneous: — Case up sinks and bath-tub with narrow beaded boards; the bath to have hard-wood top.

PAINTING.

The whole of the work usually painted, both outside and in, to have three coats of good quality white-lead and oil paint, of such color as directed; the chimneys above roofs to be painted red, with black pointing.

PLUMBING.

Tank in attic to be lined with lead; fit up planished bath-tub where shown; to be a cast-iron sink in Kitchen, with cast-iron legs and back; fit up range and water-back, connected with galvanized-iron 20-gallon boiler; the wash-tubs, sink and bath will be supplied with hot and cold water; fit up force-pump in Kitchen connected with cistern; same to supply the Kitchen sink and tank.

ESTIMATE FOR VICINITY OF NEW YORK.

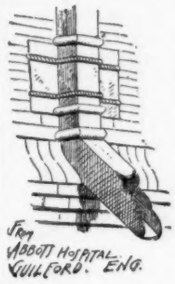
Carpenter work	$1,800.00	Painting	$175.00
Mason's "	900.00	Architect's fee	250.00
Tinning and plumbing	350.00		
Total	$3,475.00		

The above is an estimate from reliable builders near New York; they decline, however, to give the bill of quantities, on the ground that it is impossible to estimate the number of days' work.

You will observe I have put the architect's fee at $250, or 5 % on $5,000, believing this to be consistent with the schedule of the A. I. A., which states: "For work under $5,000 a special rate in excess," and as the architect's work on a $3,000-house is fully equal to that of a house costing $5,000, I consider the above charge to be correct.

THE ENGLISH CHANNEL TUNNEL. — Sir John Hawkshaw, civil engineer, recently stated that there were no engineering difficulties in the way of the formation of the tunnel between France and England, and that its maintenance would be cheap. He estimated the cost of the tunnel at £8,000,000, and said the work would occupy in construction eight years. He had no doubt as to the financial success of the undertaking. It was reasonable to reckon upon 2,000,000 passengers being carried through the tunnel annually at 6*s.* per head, and 1,200,000 tons of goods at 5*s.* per ton. That would produce a revenue of £900,000. Allowing forty per cent for working expenses, 6.75 per cent could then be paid upon the capital of £8,000,000. As one means of defence, it had been suggested that steps should be taken by which the tunnel could be flooded. He, however, was of opinion that arrangements could be made to throw up a mass of shingle inside the tunnel and thus prevent its use. If necessary, the tunnel could be blown up. Should more than one tunnel be constructed, the question whether or not they should all be defended by forts was a question for a military man. If there were several tunnels they could be easily defended by the same fortifications on the English side. The tunnel would be 180 feet below the bed of the channel. — *Exchange.*

THE SALE OF THE HURLBERT COLLECTIONS.



THERE is being sold at auction in New York while this issue of the *American Architect* is passing through the press, a collection of peculiar interest. It consists of pictures, furniture, tapestries and miscellaneous bric-à-brac gathered together during many years by Mr. William Henry Hurlbert, who is well known as an intelligent judge of the works of art of past times as well as of our own. It is only of the pictures, however, that I wish to make brief mention here. In the strict and not the advertising sense of the word they form a "unique" collection — one which is not likely to be duplicated, that is, on this side of the water. It is not often one can say of an auction sale that there is not a bad picture in the lot. But one can say it here, even of the very few modern French examples by such men as Merle and Lefebvre which have rather an alien look amid their finer surroundings, for even these few are very good specimens in their own way. Much more interesting, however, are many small canvases by the great Frenchmen of an earlier day — by Diaz, Lambinet, Michel, Faustin-Besson, Daubigny and others — almost all painted in the early days of the artists' activity and showing their powers in their most characteristic phases, before popularity and money-making had wrought their inevitable modifications. A beautiful Marilhat, one of his well-known works, is an example of a master very seldom seen on this side of the water. English pictures, too, are not wanting, as for example a Nasmyth and a little Leslie which last will be a revelation to those who know Leslie only by the crude, chalky colors of his later work as shown in the Lenox Library collection. A fine Sir Joshua, one of several versions he painted of the child with the mouse's cage, is in excellent preservation with the flesh tones still intact. Of yet greater interest, however, are the old pictures in the collection — one or two excellent and important examples of the Italian schools and a number of fine Dutch landscapes — among others a sea piece by Van Der Velde with exquisitely transparent water, two Hobbemas (one of which with dark trees and a glowing sky could not easily be surpassed), a tiny Backhuysen, a battle-piece by Teniers, and two Ruysdaels. One of these last is, I think, the gem of the collection—a small picture showing a flat Dutch landscape with a broad road that runs straight away from the spectator in the middle of the composition. In spite of this formality in theme, and in spite of the non-picturesqueness of the subject and the loving accuracy with which details have been treated, I know of no landscape of any school which is more full of grandeur and of sentiment, and it is in admirable condition, the soft blues of the exquisite sky not having faded out as is too often the case with similar works, and the golden tone of the whole being perfectly preserved. It will be a pity if all these pictures are allowed to pass into private keeping without at least an effort to secure some of them for our museums. And it will be a still greater pity, perhaps, if Mr. Hurlbert's Turner — well-known to fame but so secluded for many years that but few have seen it — is allowed to share a similar fate. Indeed there is a worse danger yet to be apprehended here; for this is a picture of which the dealers know the value, and which, if it falls into their hands, will undoubtedly be taken back to England for sale. I do not hesitate to say that it is a canvas which will show Turner to untravelled American eyes as he has never been shown before, and will prove to them for the first time that the praise which has been lavished on him by English critics has not been the mistaken eulogy of an eccentric, unbalanced, if splendid, genius. The pictures in the Lenox Library give no idea of the Turner we see on this Venetian canvas, and a dozen "Slave Ships" would be all too little to exchange for such a work. It was painted in Turner's best period when his talent had reached its highest and most personal development but had not yet fallen into the apparently wilful extravagances which mark the time when the "Slave Ship" was executed. It is a large picture, in excellent condition, pitched in a high key with a preponderance of whites and blues and with the brilliant sails of Venetian fishing-boats as its strongest notes. The catalogue will give, I believe, the "pedigree" of the picture, but it is not of the sort that needs extrinsic recommendations. Never before has there been such a chance to get possession for our public institutions of a characteristic example of Turner's most admirable mood. And it is doubtful whether, should this chance be lost, the future will supply a wiser generation with another. As will be remembered, Mr. Thomas Moran had for years a fine landscape which he attributed with much apparent justice to Turner's earlier years. Some judges said "not a Turner but an Old Chrome," but most, I think, agreed with the owner in his attribution. At all events the "Conway Castle" was a beautiful example of the kind of work done by Turner in his earlier years and by the other great men of that moment. It might well have found an honored place in one of our museums, and had we then secured this Venetian canvas of Mr. Hurlbert's to put beside it we should have had data by which the artist and his progressive art might have been studied and understood. No greater contrast could have been conceived and none more instructive to the student, whether of art principles in general, or of the life and work of the greatest of English landscape painters. The "Conway Castle" is unfortunately lost to us forever; but the "Venice" we may

still secure. Its price will doubtless be high, but it is to be hoped there is some lover of art among us wise enough to see its value and generous enough to give it to our public, either in this city or in another; or if this is too much to ask, let us hope there is some one who will save it for America even if in the semi-seclusion of a private gallery.

M. G. van Rensselaer.

THE BLISTERING OF PAINT.

Testimonial, in Wrought Iron, to Mr. V. Bal Fard. Paris. France

THE subject of the blistering of paint has from time to time engrossed the attention of practical men; but, so far as we can follow it in the literature pertaining to the building trade, its cause has never been clearly laid down, and hence it is a detail enshrouded in mystery.

We propose, in the present notice, to lay down some general rules that govern this phenomenon, if we may so call it, and from the same to draw some practical conclusions, the object of which will be to set the question at rest. The blistering of paint is in a large measure traceable to the position of the painted surface; it is usually found on work presenting a south aspect or exposed to the full rays of the sun. As a defect it is associated with the summer season, the English humid, sunless winters being opposed to its action. The deduction to be drawn from this is that it is the effect of heat. Paint, we know, is a body both mineral and metallic, made into a plastic state by oil, the object of which is to keep out the moisture from exposed surfaces in our buildings and other works, and to offer, on internal works, a uniform and pleasing surface to the eye. The oil used is linseed, which by boiling attains setting or drying qualities: its thick or heavy nature, when loaded with mineral and metallic matters, being let down for temporary or working purposes by spirits of turpentine, a volatile spirit that is a mere aid to the spreading of the paint. Paint so largely composed of oil will never fairly set or assume a dry state, one uninfluenced by heat. However dry and brittle it may appear, it is capable of being rendered soft and plastic by the application of heat, and hence the hand-stove of the painters is the most ordinary instrument for the removal of old paint. We mention this, for it is clear that, approach the subject as we will, we find heat the prime cause of the blistering of paint.

Closing in with our subject and bringing it into narrower lines, we find blistering, properly speaking, wholly confined to wood as a base or groundwork. It is true it is not unknown to iron or plaster; but in these cases it is variant in form, and not blistering in the true sense of the term. The blistering of paint on iron is not traceable to the softening of the paint and the shelling up of the same, but to water making its way to the naked iron, through some crack or defect in the paint, and becoming an active agent in oxidation. The blister thus formed is clearly the separation of the film of paint from the iron, by the formation of rust upon the face, which, as a foreign material, forms an effectual separation of the two bodies. The extension of these blisters is dependent upon the supply of water, and, unlike the true blister, is not dependent upon heat or a south or sunny aspect. The blistering of paint on iron occurs in any aspect or position in the full light, or in the dark, in the summer or the winter, the destructive agent being water; it is dependent upon no other conditions. The blistering of paint upon plaster is in a large degree analagous to that of iron, inasmuch as it is formed by the disintegration of the base by the action of water. Painted plaster-work, so long as water can be kept from percolating through the cracks or faults, or gaining entrance from above by filtration, or from below by capillary action, is a highly durable material; but the moment water gains a footing, the lime in some degree is dissolved, and, upon being removed and re-deposited, undergoes the process of recrystallization; a powdery substance is thus formed, that comes as a stranger between the paint and the plaster, in which respect it bears a strong resemblance to rust, the result of the oxidation of iron. Large faces of plaster are subject to fractures from expansion under the heat of the sun, or from the lifting of the upper members of a building, consequent upon the admission of water from gutters or copings, the lifting being the result of secondary crystallization set up in the joints of mortar. We thus get an explanation of the fact that the blistering of paint, so to speak, always occurs in the neighborhood of cracks or fractures in the plaster, and is more pronounced in the cornice or upper part than in any other part of a building. In proof of its being the result of crystallization, the face of the plaster is always found to be covered over with powdered lime. The painter, finding this, takes care to saturate the disintegrated face of the framework in effecting repairs; but this, as he finds to his chagrin, is no protection against the recurrence of the evil, for so long as water or moisture is admitted at any point, so long will this abnormal blistering ensue. The blistering o paint upon plaster-work, like that upon iron, is not dependent upon heat; it is a chemical action set up by water upon a body of dry lime in a partial state of crystallization; it is caused by the lime dissolving and its removal — it may be in but an infinitesimal degree — and its recrystallization. Upon the water evaporating, the result is a dry powder that works an effectual separation between the film of paint and the groundwork of plaster, and it does not attach itself to either of the bodies, but remains a powder until the film of paint or blister is removed, when it may be dusted off with a brush.

The blistering of paint upon wood is distinct in its order, and is the general blister known in the trade. It occurs on the face of wood-work exposed to the sun, and is traceable to the influence of heat. It is not pronounced in the case of new work, where the body of paint is not great; but it is a great evil and an eyesore on old work, where the coats of paint are layered one on the other. Wood as a groundwork is a porous body, highly charged with moisture in a natural state, and never free from it in a so-called dry state, when used in exposed situations. It may be taken that wood, during the winter season, or one-half of the year, is absorbing moisture. We may see this in our outer doors, our gates, our sliding sashes, and our shutters, for the joiner is constantly being called into requisition to ease the same. This moisture, so largely present in the atmosphere, cannot be kept out of the wood by the most careful painting. In our shop-fronts it has ready access to the back of the wood-work, the face sides being the only ones which are painted; in our doors and gates it is absorbed from the sills or the ground, from the fact that the lower edges are unpainted. There is always some portion of the wood-work hid from the eye, which is unpainted, and there the system of absorption is active during the winter or rainy season. Wood in this state, during the hottest days in the summer, will make efforts to throw off this moisture. We then find the heat of the sun applied with great force to the painted face, and the unpainted face to be in the cold shade. The effect of this powerful heat is to draw the moisture to the face of the wood, where its course is arrested by sundry impervious coats of paint; it is here generated into steam, the expansive power of which forces away the paint, and the familiar blister is formed. Paint, as a mineral or metallic body, does not incorporate with the wood; it simply adheres thereto, forcing its fronds, so to speak, into the pores of the wood, and filling up the interstices formed by the bundles of fibres. Hence we find that paint fails to adhere to highly-resinous or greasy woods, and the knots themselves, from being hard and compact, must be faced with knotting composition as a ground for the paint. Paint, in parting company with wood, or, in other words, forming a blister, will adopt one of two courses: —

First, to tear itself clear from its association with the wood. Examined by a glass it will be found to have a rough underface, the exact counterpart of the porous face of the wood. It will resemble the inner face of beech-bark, which presents innumerable vertical plates, the casts, as it were, of little interstices in the woody face of the tree.

Second, to tear itself clear from the first coating or priming on the face of the wood, the outer coats only forming the blister. This latter is the most ordinary course followed by heat or steam blisters, but in cold-water blisters, a form of blister not generally known, but one upon which we shall offer a few remarks, the first of the above courses is followed, and the paint as a body is forced from the wood.

It must be understood that there are certain well-defined laws regulating the blistering of paint. The groundwork must be a soft, porous, absorbent wood in which a sufficient amount of moisture is present to create steam beneath the impervious coating of paint. The paint must be of sufficient body or texture to be impervious. If it is thin, the natural accompaniment of new work, it will not blister, for it is not impervious, and the steam will escape into the rarefied atmosphere; and hence we find blistering wholly associated with old work upon which a great body of paint is present.

The remedy for this ordinary steam-blistering of paint is, on the one hand, to paint the back side of the wood as well as the ends and edges, and so prevent the absorption of moisture during the wet or winter season. This we admit is a most difficult operation. On the other hand, hard, close, unabsorbent woods, like mahogany should be used as a groundwork where practical; failing these, the body of the paint should be thin, light, or semi-porous, and not dense or impervious. Proof of this is found in paint which has accumulated in thickness being removed by the hand-stove to prevent blistering. This is done upon soft wood as a basis, but not upon hard wood, iron, or plaster. A deal might be said upon the removal of paint by heat and chemicals, such as potash, Egyptian clay, and other compositions; but we refrain from touching upon it from the fact that it is outside the heading of this chapter.

A blister upon iron will be found to embrace the whole body of the paint, and to be ferruginous on the inner face, showing that the separation is in the iron itself. A blister upon plaster will, in like degree, embrace the whole body of paint, and be coated with lime or powder on its inner face, showing that the separation is in the plaster; indeed, this is patent, for the blister will often be found with a thick coating of plaster adhering to the same, showing that the disintegration has occurred in the body or centre of the plaster. This is a well-known fact, as, upon the repainting of plaster faces, the brick-layer is often brought upon the scene to repair the damage and restore the face for the painter.

A blister upon wood does not necessarily embrace the whole body of the paint, as the separation will often take place between the

priming, or first coat, and the subsequent coats, and it never brings away a backing of the ground-work, unless the wood be rotten, in which case it cannot be called a blister, but a falling-in or giving way of the ground-work. The rotting of wood with a painted face is a pronounced illustration of the absorbent nature of wood, when associated at the back or unprotected face with damp or moisture; such wood, if exposed to the sun on the painted face, will be the first to blister, and that which is the dryest and least absorbent in its texture, will be the last.

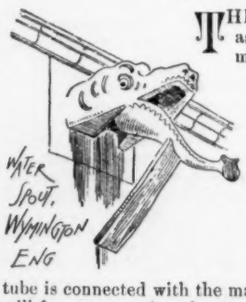
The blistering of paint upon wood is not, as is generally believed, the direct effects of heat upon the oil in the paint; if it were, we should find it taking the same action upon iron or plaster, which, we need scarcely say, is not the case. Heat in the case as above noted is a secondary agency, the primary one being steam generated from the moisture in the porous wood below or behind the impervious face or coating of paint; it is truly speaking a blister; but it is also a blow, expansion or cavity, caused by the generation of steam. Blisters formed on wood, if cut or pricked at an early stage, so as to let out the steam, may be erased by carefully rubbing them down to their original bed, especially so if the separation has taken place on the face of the wood, in preference to the face of the priming or first coat of paint.

In our researches on the subject under notice we have been materially assisted by investigating the rare phenomenon of cold-water blisters on painted wood-work. In December last, the contraction of the lead in the gutters of a house erected in the first quarter of the present century, or the expansion of the water allowed to lodge therein, by the action of frost, caused the lead to split, and upon a thaw ensuing water made its way into the interior of the house. In its downward course it took a cupboard, built in the recess of a chimney on the first floor, every part of which was saturated. The door has a moulded architrave wrought in Quebec pine; one of the jambs of this architrave imbibed an abundance of water at the mitre, which, coursing down the wood by natural gravitation, displaced the paint, and blisters appeared upon the surface identical with those formed by heat on wood-work exposed to the sun. Here was a case of blisters forming in the depth of winter on old internal wood-work, in a position where the sun at no time could shine or act upon it. These blisters, unlike those formed by steam under the influence of the sun, had a baggy appearance, as if weighted or loaded with water. Upon marking their position we found them to be travelling downwards, at the rate of about one-quarter of an inch per day. These blisters upon being pricked or cut, gave out their water, and the skin of paint allowed itself to be rubbed down into its old position, where it adhered after the supply of water had been cut off. We found that the paint, as a body, had detached itself from the naked wood, and that its inner face was an imprint of that porous body.

Water, as we know, is foreign to paint, for paint will not adhere to wet or unseasoned wood. In like manner, old paint will detach itself from wood, if the wood is highly porous and charged or saturated with moisture. In the case in point, the head of the architrave, where the grain or pores of the wood was fixed in a horizontal position, did not blister on the face. The blisters only occurred in the upper part of the architrave forming the jamb, in which the grain or pores of the wood were in an upright or perpendicular position. The vessels were here weighted or charged with water, which, as it worked to the face, forced off the paint and lodged in blisters so formed by its agency.

Blisters so formed by cold water, gravitating or coursing down the fibres of the wood, suggest the fact that they are formed with the exercise of but little force, and they prepare us for the admission that the generation of steam by the action of the sun is sufficient to account for their presence on ordinary wood-work. It must be borne in mind that the formation of these cold-water blisters could not occur except on very soft or porous wood. We were not prepared to admit that the architrave in question was so hard or dense in its texture as even Baltic red or yellow fir; or if it was fir, that it was then a wholly porous sap-wood. On investigation, we found it to be the ordinary Quebec pine, a very light, soft, porous, sponge-like wood — a class of wood highly suitable for the development of such a phenomenon; but one whose porous nature throws great light upon the subject of blistering of paint. — *W. S., in The Building News.*

THE HYDRAULIC RAM.



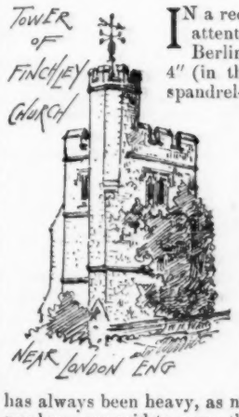
THE first invention of this motive power is ascribed to Mr. Whitehurst, a watchmaker, of Derby, England, in 1772. The operation of the hydraulic ram is as follows: A spring or other constant supply of water is used, from which a pipe of the necessary diameter is laid to a point below; the greater the fall the better. The lower end is furnished with a valve, so arranged that when the water in the pipe has acquired a given velocity it will be closed. This, of course, suddenly stops the current. If near the lower end a perpendicular tube is connected with the main tube, this sudden arrest of the fluid will force a quantity of water from the main tube to a given height. The pressure on the lower valve being thus relieved, it again opens, and the current again moves, is again arrested, and again the water rises in the tube. If an air-chamber, like the one in a pump, is affixed in connection with the bottom in the upright pipe, it will secure a more regular and constant flow of the water in the perpendicular pipe. It will also furnish security against the bursting of the pipes by the sudden closing of the valve. Estimating the general average as sixty per cent, the following rules are given for ascertaining the several possible results: —

To determine the height to which water can be raised, multiply the quantity of water to pass through the ram by the whole fall on the site, and this product by .60. Then divide this product by the quantity to be raised in the same time. Thus, if the supply be thirty gallons per minute, and the fall but one foot, how high will this raise one gallon per minute? $30 \times 1 = 30 \times .60 = 18 \div 1 = 18$, the height to which this quantity can be raised. To determine how much water can be raised a given height, multiply the quantity on the site by its fall, and this product by .60, and then divide by the given height. If one hundred gallons flow per minute, the fall be six feet, and the height required seventy feet: $100 \times 6 = 600 \times .60 = 360 \div 70 = 5$ gallons per minute. The sources of mistake that frequently occur in the rules are perhaps these: First, the want of accuracy in the .60 which is assumed as the average. This ratio will vary more or less with the length of the tubes through which the water is forced, the number or extent of angles or curves, the nature and condition of the tubes through which it passes, and this on the supposition that the machine itself is perfect in its construction.

When the ram was first invented it was supposed that it could be used for raising large quantities of water, but as yet all attempts to elevate large volumes have failed, on account of the violent shock of the valves and the heavy pulsations of the machine, which are so severe as to render it impossible to make them sufficiently strong to stand any length of time. It is to be hoped that some of these difficulties will be removed, as the ram is a most valuable machine in supplying water to mansions and factories or mills in the country, and thereby lessening the risk of fire, at little or no expense beyond the first cost of the machine. The size of a discharge-pipe for a hydraulic ram depends upon the distance the water has to be forced, the amount of pressure in the supply-pipe, etc.

To increase the capacity of a hydraulic ram, drill or file a hole about $\frac{1}{32}$ inch in diameter in the supply-pipe, about a foot above the place where it enters the ram. At every stroke of the ram a small stream will be discharged from this orifice. This at first sight would seem to decrease the power instead of augmenting it, but when the reaction takes place in the pipe there seems to be a small quantity of air sucked in, and this air is probably liberated from the water when it reaches the air-chamber, thus increasing the pressure. The writer tried this on a farm belonging to Judge Calvin E. Pratt, of the New York Supreme Court, and found it to increase materially the power of the ram. The ram was a No. 4, under four-foot fall, and after this plan was adopted it sent a one-half inch stream of water to a height of twenty-five feet, twelve hundred feet distant from the ram, and is well worth a trial by those using rams. Another method of calculation is to multiply the quantity supplied by the spring in gallons per minute by sixty-five, and multiply the product by the number of feet fall, and divide this product by one hundred times the height to which the water is to be elevated. The result will be the quantity of water raised per minute. — *The Metal Worker.*

BITUMINIZED BRICKS.



IN a recent issue, the *Deutsche Bauzeitung* called attention to an experiment in street-paving at Berlin. Bricks of the dimensions of 8″ x 4″ x 4″ (in the quality of the usual so-called white spandrel-bricks) have been employed, which have been impregnated with asphalt by a patent vacuum process. By this mode of treatment, after the expulsion of air and water has taken place, the bricks absorb from fifteen to twenty per cent of bitumen, and the porous, easily destructible substance is changed into a tough, elastic mass, said to be capable of resisting pressure and concussion in an exceptional degree, and resisting the ingress of moisture. The bricks are then laid upon a concrete foundation, six inches in thickness, by means of hot tar.

The traffic at the point in question has always been heavy, as no less than one thousand light vehicles per hour are said to cross the spot chosen for the trial, in addition to thirteen hundred tram-car journeys over this portion of the roadway. No previous system of paving has been found to last beyond three months without showing signs of injury, and the opinion is expressed that this new paving material has the needful resisting properties, as it is rougher than compressed asphalt, and harder than wood. Besides these advantages, the points of junction are said to afford a firmer foothold for the horses, and there is no ab-

sorption of moisture. The importance of the new discovery is also dwelt upon with special reference to the construction of water-proof walls, stable-pavements, counter walls, etc.

A more recent issue of the *Thonindustrie Zeitung* discusses the matter in a critical spirit, and records the fact that at the point named some of the bricks display, after about three months' wear, such crumbling that they have had to be replaced, which has, however, been done with comparative ease and rapidity. It is remarked that the rather sudden failure of these bricks is the more surprising as they had not previously exhibited signs of wearing away, and doubts are expressed whether the material chosen to be impregnated is really the most suitable for the purpose. An examination by Herr Rühne of specimens of the defective bricks seems to have raised in his mind some doubts as to the efficacy of the process as really increasing their resisting properties. Machine-made bricks had been used, which are, as a rule, wanting in homogeneousness, and although the surface was decidedly strengthened by the process, the middle of some of the bricks had apparently not been impregnated. He does not, however, attach any conclusive importance to these appearances, as some of the crumbled bricks were impregnated throughout. The reason of the sudden wearing away when once the outer surface has been affected is not easy to explain, as frost could not have penetrated the surface, and it is not supposed that it could have rendered the asphalt brittle. Hence it is argued that the want of complete success may be fairly attributed to the kind of brick chosen, and possibly in some degree to some peculiarity in the manner in which the process of impregnation has been carried out. The hope is expressed that further experience will remedy the partial imperfections which have been found to exist in the application of the principle indicated.

A correspondent of the same journal remarks that wall-bricks can, by an old method, be impregnated up to twenty-three per cent of their original weight, with a mixture of asphalt and tar, and that he fails to see the advantages of the new process. He gives various interesting details in proof of his assertion that the strength of the impregnated brick is dependent upon its qualities before impregnation, and that the process in question cannot remedy such defects as have originally existed in the bricks.

According to the quoted reports of the municipal authorities of Stuttgart, the system of laying down the bricks impregnated according to the older process, between the tramway lines, has proved decidedly successful. An extension of its application is recommended on the grounds of the durability thus arrived at, as well as the more comfortable track which is obtained, and the contingent economy in the supply of horses for the requirements of the traffic.

"RAMBLING SKETCHES."

New York, May 15, 1883.

To the Editors of the American Architect: —

Gentlemen, — Can you inform me where I can procure a copy of "Rambling Sketches" by T. Raffles Davison? Would also like to know the price of the book. Yours truly, J. W. C.

[You can obtain Mr. Davison's "Rambling Sketches" of Mr. H. P. Kenway, 220 Devonshire St., Boston. Price, $5.25. — Eds. American Architect.]

"ORIGINAL PORTRAITS OF WASHINGTON."

204 So. Fifth St., Philadelphia, May 24, 1883.

To the Editors of the American Architect: —

Dear Sirs, — My attention has been called to a card presumably from Miss Elizabeth Bryant Johnston, compiler of the work entitled *Original Portraits of Washington*, reviewed by me in your paper of June 10, 1882, in which Miss Johnston accepts my offer of material to improve and correct her work in a subsequent edition. I am glad to know that a new edition is to be published, but wish that it might be an entirely new book; however that may be, if Miss Johnston will send me a working copy of her book — that is, interleaved sheets — I will gladly make such corrections and additions as my *data* will afford. Very respectfully yours, Chas. Henry Hart.

SUB-SURFACE DRAINAGE.

Winnepeg, May 22, 1883.

To the Editors of the American Architect: —

Gentlemen, — I have read with much pleasure and profit the various articles which have appeared from time to time in your valuable paper on the subject of sewerage for isolated houses or small towns, and more especially those having reference to sub-surface irrigation. As this system cannot be satisfactorily used in a cold country where the frost enters the ground from three to four feet, I should be glad if some of your correspondents would deal with the question under the circumstances referred to, that is, the disposal of sewage in a country where the winters are long and cold.

Yours respectfully, J. Greenfield.

[We believe that Colonel Waring is of the opinion that a properly arranged sub-surface drainage system is not prevented from working properly by any degree of cold, the heat latent in the waste liquids being sufficient to thaw a passage for each discharge from the flush-tank with sufficient rapidity to prevent congelation taking place within the pipes. — Eds. American Architect.]

BOOKS FOR BEGINNERS.

Richmond, May 23, 1883.

To the Editors of the American Architect: —

Dear Sirs, — Will you be so kind as to inform me through the *American Architect*, what books you would advise a person who desires to learn architecture to study?

Yours respectfully, G.

[For the history of architecture, read Fergusson's "*History of Architecture*," three volumes; for the "orders," study Vignola or Sir William Chambers; for a review of architecture in all its branches, study Gwilt's "*Encyclopedia of Architecture*." These books can be ordered through any first-class book dealer. For construction, get "*Notes on Building Construction*," published in three volumes by J. B. Lippincott, Philadelphia, price $13.00, Trautwine's "*Hand-book for Engineers and Architects*," Tredgold's "*Carpentry*;" and for American practice, study the papers on "*Building Superintendence*" published in the *American Architect* during the past two years. — Eds. American Architect.]

OUR ILLUSTRATIONS.

Spring Valley, Minn., May 24, 1883.

To the Editors of the American Architect: —

Gentlemen, — Some of your Western subscribers fail to see any point of interest in your competition for a $3,000-house, and do not know how it is going to benefit anybody unless, indeed, it should be to convince the authors of the plans of their real capacity in that line; but as we have no interest whatever in that, we should prefer to see something else illustrated in your valuable paper.

Respectfully submitted for your consideration by

H. J. Andersen.

[We are fully conscious that there may be other than "Western" architects who would prefer to have us publish illustrations of a more exalted architectural character than the designs for $3,000-houses. But we trust that the discontented will possess themselves in patience, and bear in mind that the editors have to consider the rights and interests of three important parties: (1) members of the profession, of greater or less training and capacity; (2) a very large number of non-professional subscribers, who pay their money for the sole purpose of obtaining designs which will assist them in reaching a decision as to what sort of a dwelling-house to build, or what architect to employ; and (3) the pecuniary interest of the publishers, who do not maintain this journal on purely philanthropic principles. We have not the least misgiving that each subscriber would not receive full value for his money, even should he choose to destroy the prints of these cheap houses. — Eds. American Architect.]

NOTES AND CLIPPINGS.

The Royal Fir. — One of the finest conifers in Germany, known as the Royal Fir, stands near the village of Albernhau in the Erzgebirge Mountains. Its diameter, forty inches above ground, is six feet ten inches, sufficient to conceal a horse and rider placed lengthwise behind the trunk. It begins ramifying at a height of thirty-four feet, and the full elevation to top of crown measures one hundred and fifty-four feet. It is thought to be the tallest and strongest representative of the species, not only in Germany, but in the whole of Europe. This noble tree, which is supposed to be five hundred years old, now shows signs of decay, having died out on the apex of the crown since the year 1874. The enormous dimensions of the tree may be better realized by cordwood measure. The shaft is estimated at 51¼ cords; limbs and brushwood, 12¾ cords, making in all 64½ cords.

Testing a Lightning-Conductor. — The spire of the General Assembly Hall, Edinburgh, has just been fitted up with a new lightning-conductor. Some doubt having been expressed, says the *Electrical Review*, as to the efficiency of the old conductor, it was resolved to subject it to a strict test, and for this purpose a copper wire was carried up one side of the spire and attached to the conductor on the other side. When the connection was effected, the electrical resistance is said to have reached the "very alarming amount of eight hundred ohms." The conductor was jointed together by screw-couplings, and this extraordinary resistance is explained to have been due to the "defective character of many of these couplings."

Excavating at Luxor. — The great temple at Luxor is being excavated, and the inhabitants of the mud huts that filled every part are being evicted by wholesale. Professor Maspéro has found in Upper Egypt the sepulchre of one Shes-Horhotep, which is a marvel of painting and design. It has been taken to pieces, slab by slab, and sent by water to the Boolak Museum. A new royal sepulchre and seventeen fine mummies of the Greek period are only part of Professor Maspéro's spring campaign. Greek, Syriac and Coptic inscriptions of the fifth century, A.D., both formal and *graffiti*, have been obtained, as well as Coptic sermons written on stone in red ink. — *Exchange.*

The Wood Pavement in the Champs Elysees. — The new wood pavement in the Champs Elysées, which extended only half the length of the avenue, has stood the test of an entire winter, and so it is to be laid to the Arc de Triomphe. This pavement has been put down by an English company. The process of putting it down is as follows: The ground is first excavated about a foot in depth. A layer of stones about the size of walnuts, and mixed with cement, is then laid down. On this a second coat of cement, about an inch in thickness, is carefully spread. The blocks, which are previously prepared by being saturated with some resinous compound into which tar enters largely, are set upon this cement; they are six inches thick by a foot in length and three and a half inches in breadth. A space is left between each block, and after they are laid a thick preparation of tar is poured over them, followed by an application of fine gravel. Finally, the interstices are filled with cement. — *Exchange.*

BUILDING INTELLIGENCE.

(Reported for The American Architect and Building News.)

[Although a large portion of the building intelligence is provided by their regular correspondents, the editors greatly desire to receive voluntary information, especially from the smaller and outlying towns.]

BUILDING PATENTS.

[Printed specifications of any patents here mentioned, together with full detail illustrations, may be obtained of the Commissioner of Patents, at Washington, for twenty-five cents.]

276,991. BRICK-MACHINE. — James C. Anderson, Highland Park, Ill.

277,021. SAW. — Emile H. Gabus, Stryker, O.

277,026. SAW-HANDLE. — Joseph Hall and Louis St. Andre, Clear Lake, Wis.

277,049. FIRE-ESCAPE. — Samuel T. Mickey, Salem, N. C.

277,058. DEVICE FOR LATHING. — Stuart Perry, Newport, N. Y.

277,73. SAFETY-ATTACHMENT FOR ELEVATORS. — Peter S. Singer, Chicago, Ill.

277,090. SANDPAPERING-MACHINE. — Henry T. Weirbach and Mahlon C. Bitting, Allentown, Pa.

277,1 5. BIT-STOCK. — William J. Bayrer, Southington, Conn.

277,110. PNEUMATIC INDICATOR AND SPEAKING-TUBE. — Jacob Capron, New York, N. Y.

277,111. WINDOW-SCREEN. — John W. Carman, Fort Atkinson, Wis.

277,113. AIR-GAS MACHINE. — James P. Clifford, Brooklyn, N. Y.

277,124. FIRE-ESCAPE LADDER. — Andrew C. Ferris, Hackensack, N. J.

277,156. FIRE-ESCAPE TOWER. — Simeon J. Pardessus, Brooklyn, N. Y.

277,158. BENCH-VISE. — Granville W. Pittman, Keokuk, Iowa.

277,172. WATER-CLOSET TANK OR CISTERN. — Henry Sutcliffe and Wright Sutcliffe, Halifax, County of York, England.

277,17 . FIRE-ESCAPE. — Alfred S. Trafton, Portsmouth, N. H.

277,202. SCREW-DRIVER. — August Benson, Worcester, Mass.

277,222. FLEXIBLE FIRE-ESCAPE LADDER. — Wesley C. Bush, Brooklyn, N. Y.

277,226. SAFETY-ATTACHMENT FOR ELEVATORS. — Charles A. Carscadin and Frank P. Fish, New York, N. Y.

277,254. METALLIC ROOFING. — Thomas F. Fitzberger and John Fitzberger, Baltimore, Md.

277,293. WATER-CLOSET APPARATUS. — Karl E. Kritch, Cleveland, O.

277,295. EXTENSION-LOCK FOR DOORS. — John Kuster, Jr., Stamford, Conn.

277,296. RINGING BURGLAR-ALARM. — Allison W. Lawson, Midway, Ala.

277,311. MODE OF CONSTRUCTING ANVILS. — William C. McCarthy, Pittsburgh, Pa.

277,332. MACHINE FOR FLATTENING THE SEAMS OF SHEET-METAL ROOFING. — William Painter, Jas. L. Murrill, and Louis R. Keizer, Baltimore, Md.

277,340. FIRE-ESCAPE. — Albert L. Pitney, Washington, D. C.

277,343. SAFETY-ATTACHMENT FOR ELEVATORS. — Alva C. Rice, Worcester, Mass.

277,370. SPRING-HINGE. — Jas. Spruce, Waterbury, Conn.

277,376. FIRE-ESCAPE. — William H. Stuckey, Covington, Ky.

277,381. BLIND-STOP. — Leonard Tilton, Brooklyn, N. Y.

277,386. FIRE-ESCAPE. — Albrecht Vogt, Rochester, N. Y.

277,389. FIRE-ESCAPE. — John D. Weed, Buffalo, N. Y.

277,415. FIRE-ESCAPE. — Harlan Fairbanks, Boston, Mass.

277,421. BRICK-KILN. — Willis N. Graves, St. Louis, Mo.

277,430. TAP-WRENCH. — Albert J. Smart, Greenfield, Mass.

277,433. FIRE-ESCAPE. — Abraham Todd and Leander H. McKee, Constantia, N. Y.

277,441. SASH-FASTENER. — Henry Bausch, Rochester, N. Y.

277,481. AUTOMATIC FIRE-EXTINGUISHER. — Richard W. Grinnell and Frederick Grinnell, Providence, R. I.

277,485. METALLIC SKYLIGHT. — George Hayes, New York, N. Y.

277,486. CLEANING CISTERNS. — William S. Henson, Newark, N. J.

277,502. SAW-HANDLE. — John Neimeyer, Trenton, O.

277,508. SPEAKING-TUBE APPARATUS. — George J. Quinsler, Boston, Mass.

277,511. PUNCHING AND RIVETING ANVIL. — John C. Rothbarth, Buffalo, N. Y.

277,526. FIRE-GRATE. — Benj. S. Wash, St. Louis, Mo.

277,532. LEWIS. — Charles W. Ash, Boston, Mass.

277,542. DOOR-HANGER. — Chas. W. Bullard, Maywood, Ill.

277,556. BENCH-PLANE. — Daniel M. Fielding, Decatur, Ill.

277,561. SCREW-DRIVER. — Isaiah M. Furbish, Augusta, Me.

277,570. VISE. — William Johnson, Lambertville, N. J.

277,590. WRENCH. — Joseph McAlpin, San Francisco, Cal.

277,591. SASH-FASTENER. — William L. McKelvey, Youngstown, O.

277,592. VISE. — Norman M. McLeod, Cambridge, Mass.

277,599. SCREW-DRIVER. — Daniel Nei, St. Louis, Mich.

277,6 0. FIRE-ESCAPE. — Frederick Newhouse and Henry Mooers, Toledo, O.

277,691. SOLDERING-IRON. — Albert P. Olmstead, West Troy, N. Y.

277,608. FLEXIBLE-JOINTED SHUTTER. — John P. Recker, Indianapolis, Ind.

277,616. DOOR-LOCK. — William Rowe, Haverhill, Mass.

277,656. TRAP. — Robert Williams Armstrong, Belleek, County of Fermanagh, Ireland.

277,663. COMBINED SHUTTER-WORKER AND BLIND-SLAT OPERATOR. — David Beal, Doylestown, O.

277,680. LOCK-HINGE. — John K. Clark, Buffalo, N. Y.

277,695. FORMATION OF DEEP WELLS IN QUICK-SAND, ETC. — Jarvis B. Edson, Adams, Mass.

277,767. BENCH-PLANE. — Frank A. Mershon, Philadelphia, Pa.

277,810. WOOD-PRESERVING COMPOSITION. — Luke N. Teachman, Lincoln, Neb.

277,814. FIRE-PROOF CEILING. — James E. Ware, New York, N. Y.

277,820. DOOR-CHECK. — Rufus Wright, Akron, O.

277,858. WEATHER-STRIP. — Thomas Urie, Boulder, Col.

277,859. COUNTERSINK FOR BITS. — Richard J. Welles, Chicago, Ill.

277,879. DOOR-LATCH. — Conrad G. Burkhardt, Chicago, Ill.

277,841. SPRING-HINGE. — Theodore Butler, Cleveland, O.

277,882-883. TOOL-HOLDER FOR GRINDSTONES. — John I. Carr, Chicago, Ill.

277,887. DOUBLE-ACTING OUTWARD-PULLING WEATHER-STRIP. — Edward Conklin, Channahon, Ill.

277,888. PLUMBER'S TRAP. — Patrick Connolly, Brooklyn, N. Y.

277,890. WEATHER-BOARDING GAUGE, CLAMP AND SAW-GUIDE. — Thomas M. Dedman, Des Moines, Iowa.

277,891. FIRE-ESCAPE. — Albert C. Ellithorpe, Chicago, Ill.

277,914. MACHINE FOR DRESSING STONE. — Alexander McDonald, Cambridge, Mass.

277,925. HINGE. — Charles Pfauntz, St. Louis, Mo.

277,953. MECHANICS' SCAFFOLD. — Lacy T. Steele, Raymond City, W. Va.

277,963. WASH-STAND. — George E. Waring, Jr., Newport, R. I.

277,966. AUGER. — James L. Whiteside, Chattanooga, Tenn.

277,971. WINDOW-SHUTTER. — Joseph Wrightsman, Harper, Kan.

277,973. CALIPERS. — George Amborn, Jr., and Edwin D. Chaplin, Pawtucket, R. I.

277,980. FASTENER FOR THE MEETING-RAILS OF SASHES. — Henry L. Blodgett, Chicago, Ill.

277,992. FIRE-ESCAPE. — Rolla M. Chase, Bethel, Vt.

277,995. FIRE-ESCAPE. — William A. Cornyn, Pontiac, Mich.

278,028. LIGHTNING-ROD. — Augustus C. Lobdell, Chicago, Ill.

278,034. FIRE-ESCAPE. — Friedrich Melchior, New York, N. Y.

278,042. SASH-BALANCE. — Daniel L. Phipps, Millington, Mich.

278,045. SEWER-TRAP. — Geo. A. Reich, San Francisco, Cal.

278,050. PLATFORM-ELEVATOR. — George Ruddell, New York, N. Y.

278,053. RATCHET-WRENCH AND DRILL. — William C. Shipherd, Cleveland, O.

278,066. DOOR. — John M. J. Wernert, Paw Paw, Mich.

278,128. SHINGLE-SAWING MACHINE. — William H. Gray, West Falls, Md.

278,135. WRENCH. — Jerome M. Hamrick, Buffalo Gap, Tex.

278,171. FIRE-ESCAPE. — William Oldroyd, Columbus, O.

278,177. MORTISING-TOOL. — Charles H. Pettit, Jersey City, N. J.

278,189. BALL-COCK. — William Smith, San Francisco, Cal.

278,191. GRATE. — Sidney D. Spence, Ludlow Grove, O.

278,200. BALUSTER. — William J. Tait, Jersey City, N. J.

278,204. SELF-CLOSING HATCHWAY. — George W. Van Allen, New York, N. Y.

278,225. CALIPERS. — Ralph Crittenden, Hartford, and Robert G. Henry, Waterbury, Conn.

278,238. EMBOSSING UPON PLASTERED WALLS AND OTHER SURFACES. — John H. Harding, Milwaukee, Wis.

278,249. FIRE-ESCAPE. — Henry H. Little, Chambersburg, Pa.

278,261. SCREW-DRIVER. — Christopher H. Olson, Decatur, Ill.

278,264. PIPE-TONGS. — Thos. Patton, Cleveland, O.

278,265. WRENCH. — Daniel R. Porter, Randolph, Mass.

278,268. BRICK-MOULD AND BRICK. — Louis Prince, Washington, D. C.

278,278. ROOFING OR SHEATHING PAPER. — Augustine Sackett, New York, N. Y.

278,301. FIRE-ESCAPE. — David Welsh, Washington, D. C.

SUMMARY OF THE WEEK.

Baltimore.

BUILDING PERMITS. — Since our last report twenty-seven permits have been granted, the more important of which are the following:

Gustav Krug, three-st'y brick building, w s Jasper St., rear of, s w cor. Saratoga and Jasper Sts.

Thompson & Stone, 4 two-st'y brick buildings, w s Chester St., between Fayette St. and Fairmount Ave.

Henry Lancaster, two-st'y brick building, w s Pennsylvania Ave., between George and Biddle Sts.

J. L. Stieff, three-st'y brick building, n s Baltimore St., between Pine and Pearl Sts.

Valentine Noha, 2 two-st'y brick buildings, n s Hudson St., e of Hair St.

Amanda Lumpkin, two-st'y brick building, e s Chesapeake St., between Hudson and Dillon Sts.

Amos V. Colley, 8 two-st'y brick buildings, s s Winchester St., n of Fremont St.; and 8 two-st'y brick buildings w s Carlton St., s of Winchester St.; and 2 two-st'y brick buildings, on Ten-foot Alley, rear of Carlton St., s of Winchester St.

J. Frank Buzby, 2 two-st'y brick buildings, in rear of e s Warner St., s of Henrietta St., and two-st'y brick stable, w s China Alley.

Boston.

BUILDING PERMITS. — *Brick.* — *Oxford Terrace*, Ward 11, for Nathan Matthews, apartment-house, 48′ x 93′, four-st'y flat.

Oxford Terrace, Ward 11, for Nathan Matthews, apartment-house, 48′ x 64′, four-st'y flat.

Oxford Terrace, Ward 11, for Nathan Matthews, apartment-house, 20′ and 6′ x 80′ and 88′, four-st'y flat; Thomas R. White, builder.

A St., Nos. 42 and 44, Ward 13, for Thomas Smith, 2 dwells., 22′ x 40′ each, four-st'y flat.

Tremont St., Nos. 1441 and 1443, Ward 22, for Emanuel Nathan, 2 dwells. and stores, 25′ x 39′, three-st'y flat; ell, 13′ x 28′; Gottlieb Merz.

Beacon St., No. 184, rear, Ward 11, for Lucius M. Sargent, stable, 25′ x 40′, one-st'y flat; Richardson & Young, builders.

Newbury St., near West Chester Park, Ward 11, for Arthur Hunnewell, dwell. and stable, 25′ x 80′, two-st'y flat.

Commercial St., No. 464, Ward 6, for Wm. Carr, dwell., 24′ x 26′, four-st'y flat; G. T. Burnham, builder.

Sherman St., near Dale St., Ward 21, for Charles Carter, bakery, 19′ x 30′, one-st'y flat; G. A. Brackett, builder.

Clark St., No. 30, Ward 6, for Patrick Canney, dwell. and store, 14′ x 23′, four-st'y flat; D. Sullivan & Son, builders.

Wood. — Bunker Hill St., Nos. 135 and 137, and Monument St., Nos. 35 and 37, Ward 3, for Michael Kelley, dwell. and store, 19′ and 22′ x 37′, ell, 19′ x 22′, three-st'y flat; Edwin W. Archer, builder.

Bunker Hill St., No. 139, Ward 3, for Michael Kelley, dwell., 20′ 9″ x 36′ and 11′ x 12′, three-st'y flat; Edwin W. Archer, builder.

Woodland Ave., rear, near Grampian Way, Ward 24, for Darius Wellington, mechanical and storage, 22′ x 22′, two-st'y hip; Augustus H. Nickerson, builder.

Lexington St., No. 237, Ward 1, for Paul Kpowles, dwell., 23′ x 55′, two-st'y hip; Joseph M. Towles, builder.

Walnut Ave., No. 107, cor. Dale St., Ward 21, for Wm. Donaldson, dwell., 29′ and 31′ x 40′, two-st'y pitch; Wm. Donaldson, builder.

Jamaica St., No. 100, Ward 23, for Catherine Downey, dwell., 22′ x 29′ and 13′ x 16′, two-st'y pitch; John Gately, builder.

Georgia Ave., rear, near Hartwell St., Ward 21, for Richard Addison, stable, 20′ x 32′, one-st'y pitch; Philip B. Ritner, builder.

Lexington St., No. 233, Ward 1, for Mary E. Hayes, dwell., 23′ x 52′, three-st'y hip; Joseph M. Towle, builder.

Holbrook St., near Eliot St., Ward 23, for Myrick G. Esterbrook, 2 dwells., 19′ 6″ x 29′ and 16′ x 25′, two-st'y pitch; John Benedict, builder.

Brook Ave., near Dudley St., Ward 20, for Patrick Meegan, dwell., 22′ x 32′ and 15′ x 16′, two-st'y pitch; Edward H. Sawyer, builder.

Dudley St., No. 193, rear, for John D. Wester, storage lumber, 30′ x 40′, one-st'y flat; Edward H. Sawyer, builder.

Unnamed St., near Centre St., Ward 23, for Mrs. Caroline L. Lewis, 2 dwells., 30′ x 31′, two-st'y pitch; Holbrook & Harlow, builders.

Brooklyn.

BUILDING PERMITS. — *Elm St.*, s s, 114′ 11″ w Bushwick Ave., 3 two-st'y frame dwells., tin roofs; cost, each, $2,800; owner and builder, Frederick Herr, 778 Broadway; architect, Wm. Clement.

Willoughby Ave., s s, 106′ e Tompkins Ave., two-st'y brownstone front dwells., tin roofs; cost, $3,500; owner, architect and builder, Richard C. Addy, 594 Willoughby Ave.

Lexington Ave., No. 71, three-st'y brick tenement, tin roof; cost, $4,000; owner and builder, Martin Byrne, 301 Greene Ave.; architect, A. Hill.

Greene Ave., n s, 75′ w Stuyvesant Ave., 3 two-st'y brownstone front dwells., tin roofs; cost, each, $4,000; owner, Rev. A. S. Walsh, N. Y. City; builder, A. Miller.

Sixth Ave., n e cor. Union St., three-st'y brownstone front dwell., tin roof; cost, $15,000; owner, Mary Skelly, 205 Sixth Ave.; architect and builder, Andrew Hilson.

Thirteenth St., n s, 347′ 10″ e Fourth Ave., three-st'y brick tenement, tin roof; cost, $3,500; owner, architect and builder, J. W. Mount, 246 Eleventh St.

Buffalo, N. Y.

ARMORY. — Brick armory, Fremont Pl.; cost, $12,000.

CHURCH. — Delaware Ave. Baptist Church, brick and brownstone; cost, $25,00 ; architect, C. K. Porter.

PARK BUILDING. — Frame building on the Park grounds at the front, owned by city, waiting-rooms and refectory; cost, $10,000; architect, E. L. Holmes.

ROUND-HOUSE. — Round-house for Nickel Plate road, South Buffalo; cost, $25,000.

STORES AND OFFICES. — Richmond Building, stores and offices, five-st'y, brick, brownstone and terra-cotta; owner, Jewett M. Richmond; architect, M. E. Beebe; location, cor. Ellicott and Seneca Sts.; cost, $80,000.

Remodelling and additions to the Chapin Block, cor. of Swan and Erie Sts.; cost, $75,000; owner, Frank Hamlin; architects, Caulkins & Co.

Brick and Ohio stone office building, Washington St., five-st'y; cost, $150,000; owners, Adams & Moulton; architects, Porter & Percival.

Drug-store and dwell., cor. Niagara and Jersey Sts., brick and brownstone; cost, $8,000; owner, E. K. Smither.

Chicago.

HOUSES.—Burling & Whitehouse, architects, have plans ready for a house for Mr. C. T. Yerkes, cor. of Michigan Ave. and Thirty-second St., brownstone front, hard-wood interior; cost, $50,000.

The same architects have on hand four houses, cor. of St. Clair and Ontario Sts., for Estate of Wm. B. Ogden. They will be of Chicago pressed-brick and terra-cotta, in Queen Anne style; cost, $60,000.

Mr. H. I. Cobb, of the firm of Cobb & Frost, architects, has planned a house for himself on the west side of Rush St., south of Superior St. The dimensions will be 25′ x 66′, four stories high, rock-faced brownstone, red slate roof.

WAREHOUSE.—Burling & Whitehouse, architects, have prepared plans for a four-st'y brick warehouse, 148′ x 150′, for the Empire Warehouse Company, at the cor. of Fulton and Clinton Sts.; cost, $55,000.

BUILDING PERMITS.—C. Barton, two-st'y brick store and dwell., 22′ x 68′, 402 West Huron St.; cost, $3,000.

Julius Zittel, three-st'y brick flats, 50′ x 70′, 641-643 Harrison St.; cost, $12,000.

A. L. Chetlain, three-st'y brick dwell., 23′ x 66′, 407 Dearborn Ave.; cost, $7,000.

M. Barts, two-st'y brick dwell., 20′ x 60′, 578 Twenty-first St.; cost, $3,000.

John A. Lend, three-st'y basement brick store and dwell., 42′ x 100′, Franklin St., cor. Ontario St.; cost, $20,000.

Ann Bright, two-st'y basement brick dwell., 21′ x 50′, 247 Loomis St.; cost, $4,000.

G. Sidlacek, two-st'y basement brick dwell., 21′ x 57′, 59 Fisk St.; cost, $3,400.

F. Prindiville, two-st'y brick dwell., 20′ x 60′, 110 Cornell St.; cost, $7,000.

E. Lane, three-st'y brick store and dwell., 24′ x 60′, 3614 State St.; cost, $4,500.

Hammill & Congdon, 3 three-st'y brick dwells., 50′ x 70′, 273-275 Lasalle Ave.; cost, $15,000.

Christian Reformed Church, two-st'y basement brick dwell., 22′ x 44′, 523 West Fourteenth St.; cost, $3,000.

Wm. Hunkel, two-st'y basement brick dwell., 22′ x 48′, 451 West Twelfth St.; cost, $4,500.

W. P. Smith, 6 two-st'y brick dwells., 45′ x 117′, Rhodes Ave., cor. Thirty-second St.; cost, $18,000.

Aug. Kuhn, two-st'y basement and attic brick dwell., 22′ x 50′, 151 Fowler St.; cost, $3,500.

Ryan Bros., three-st'y basement brick store and dwell., 25′ x 57′, 1199 Milwaukee Ave.; cost, $3,500.

Fred Krehm, 2 two-st'y basement brick store and dwells., 48′ x 80′, 484-486 Larrabee St.; cost, $11,000.

A. Kaiser, two-st'y brick dwell., 21′ x 60′, 148 Maxwell St.; cost, $3,500.

D. Lane, two-st'y basement brick dwell., 22′ x 70′, 402 Jackson St.; cost, $5,000.

James Dunn, brick market-building, 80′ x 150′, Clinton St., cor. Jackson St.; cost, $9,000.

Board of Education, three-st'y basement brick school-house, Ashland Ave., cor. Cornelia St.; cost, $42,000.

Jacob Rosenberg, three-st'y brick tenement-house, 77′ x 87′, Groveland Park, cor. Twenty-eighth St.; cost, $27,000.

Chas. Langman, one-st'y basement blacksmith-shop, 25′ x 58′; cost, $3,000.

E. H. Eilers, three-st'y brick store and dwell., 25′ x 40′, 274 Twelfth St.; cost, $4,000.

Wm. Buesman, two-st'y basement brick dwell., 21′ x 40′; cost, $3,400.

John M. Smyth, four-st'y basement brick store and theatre, 80′ x 100′, 150-156 Madison St.; cost, $50,000.

Lambert Tree and George M. High, five-st'y basement brick store, 80′ x 111′, cor. Lake and Lasalle Sts.; cost, $60,000.

C. J. Hull, four-st'y brick dwell., 63′ x 73′, Park St., cor. Ashland Ave.; cost, $18,000.

C. J. Hull, three-st'y brick dwell., 50′ x 100′, 31 South Ashland Ave.; cost, $18,000.

Campbell Bros., 6 two-st'y brick dwells., 36′ x 125′, 412-422 Leavitte St.; cost $18,000.

John Reddy, two-st'y brick dwell., 22′ x 50′, 3437 Dearborn St.; cost, $4,000.

Matt Farley, one-and-a-half-st'y brick cottage, 20′ x 43′, 302 Henry St.; cost, $3,500.

Cincinnati.

BUILDING PERMITS.—Herman Urban, three-st'y brick dwell., Ingleside Pl., Walnut Hills; cost, $15,000.

Fred. Trautman, three-st'y brick dwell., cor. Hackberry and Forrest Aves.; cost, $6,000.

Hubert Heuck, four-st'y brick stores and flats, Vine St., between Twelfth and Thirteenth Sts.; cost, $15,000.

George Krone, three-st'y brick dwell., Dandridge St., near Pendleton St.; cost, $5,300.

George K. Bartholomew, two-st'y brick building, Lawrence St., near Pearl St.; cost, $6,500.

Wm. Glenn, three-st'y stone front dwell., 367 West Seventh St., and 3 three-st'y brick dwells. on Barr St., in rear of above; cost, $15,000; Samuel Hannaford, architect.

G. J. Windl, 2 two-st'y brick dwells., Betts St., near Cutter St.; cost, $6,000.

George Holters, three-st'y brick building, Eastern Ave.; cost, $7,000.

Union Distilling Co., addition; cost, $4,000.

W. H. Firlmann, four-st'y brick store, 535 Central Ave.; cost, $15,000; Henry Bevis, architect.

W. F. Mitchel, two-st'y brick dwell., Richmond St., near John St.; cost, $4,000.

Owen Bros., three-st'y brick building, Court St., near Mound St.; cost, $8,500.

Fred. Schmidt, two-st'y frame dwell., Locust St., near McMillan St.; cost, $5,000.

M. Rosenthal, three-st'y stone front store, Fifth S., near Vine St.; cost, $8,000.

Three permits for repairs; cost, $3,000.

Total cost to date, $1,484,900,

Total permits to date, 389.

Denver, Col.

BUILDING PERMITS.—W. E. Wilson, brick dwell., Nineteenth St.; cost, $7,500; J. H. Littlefield, architect.

F. N. Davis, brick dwell., Grant Ave.; cost, $9,000; Nichols & Caumann, architects.

Rev. Geo. P. Hays, brick dwell., Washington Ave.; cost, $5,000; E. P. Brink, architect.

Public school addition, North Denver; cost, $12,000; Wm. Quayle, architect.

J. G. Thatcher, brick dwell., Sherman Ave.; cost, $10,500; F. F. Edbrooke & Co., architects.

Crescent Flouring Mill, 230′ x 150′, six-st'y, Stanton St.; cost, $30,000.

Hastings Elevator, Twelfth St.; cost, $30,000.

W. C. Lothrop, brick block, 90′ x 100′, three-st'y, Lawrence St.; cost, $50,000.

M. Benedict, brick dwell., Lincoln Ave.; cost, $10,000.

New York.

APARTMENT-HOUSE.—On the south side of One Hundred and Twenty-fifth St., 100′ w of Sixth Ave., a five-st'y apartment-house, 50′ x 100′, brick and stone, is to be built for Mr. E. H. Just, from designs of Mr. M. C. Merritt.

Three double apartment-houses, five stories high, covering ground 80′ x 125′, are to be built on West Seventy-eighth St., near Tenth Ave., from designs of Mr. O. P. Hatfield, at a cost of about $100,000.

BREWERY.—A five-st'y brick brewery, 36′ x 50′, is to be built on the north side of Eighteenth St., between Seventh and Eighth Aves., from designs of Messrs. A. Pfund & Son, to cost about $30,000.

CLUB-HOUSE.—The New York Athletic Club have purchased the property on the s w cor. of Fifty-fifth St. and Sixth Ave., 75′ 5″ x 100′, and will at once commence building a club-house, six stories high, of brick and stone, in the Gothic style, to cost about $200,000; Mr. H. Edwards-Ficken is the architect.

CHURCH.—The St. Nicholas German Roman Catholic Church propose erecting a church at Nos. 104 and 106 First St.

STORES.—Mr. Chas. C. Haight has been selected as architect for the store previously reported to be built for Messrs. Brooks Bros.' occupancy, on the s e cor. of Broadway and Twenty-second St. The building is to be 100′ x 100′, five stories high, brick and stone fronts, and will cost about $200,000.

A four-st'y and basement store, brick with Wyoming bluestone finish, 43′ x 60′, is to be built for Messrs. Morris B. Baer & Co., on the cor. of West Broadway and York St., at a cost of about $30,000, from designs of Mr. Jos. M. Dunn.

WAREHOUSE.—A two-st'y warehouse, brick and stone, 75′ x 113′, is to be built on Sixteenth St., w of Ninth Ave., for Messrs. Thos. McMullen & Co., at a cost of about $45,000, from designs of Mr. A. Hatfield.

Fresh bids are being received for the large warehouse designed some time since by Mr. C. C. Haight, and to be built for the Trinity Church Corporation, on the east side of Greenwich St., running through from Vestry St. to Desbrosses St.; probable cost, about $200,000.

HOUSES.—For Mr. George Wood a four-st'y brick and stone house is to be built on Fifty-fourth St., adjoining St. Luke's Hospital, to cost $50,000.

For Mr. C. T. Barney a four-st'y brick and stone house, 27′ 11″ x 100′, to cost $80,000, is to be built on the s e cor. of Fifth Ave. and Sixty-third St.

For Mr. John S. Kennedy a fire-proof house, 30′ x 90′, with extension, is to be built; all three from designs of Mr. R. H. Robertson.

Six more houses are to be built for Mr. Ed. Kilpatrick, on the north side of Eightieth St., 200′ w of Madison Ave. They are to be brick and stone, four stories high, 15′ 8″ to 21′ x 67′; Messrs. D. & J. Jardine, architects.

OFFICE-BUILDING.—The four stores adjoining the old Stewart wholesale store, on Chambers St., are being torn down, and a new building is to be erected in conjunction with the old building, which is being improved and raised a story. The total cost of the improvements will be about $400,000.

ADDITION.—An addition is to be made to the house of Mr. J. Heron Crossman, No. 33 West Fiftieth St., from designs of Mr. A. H. Thorp.

BUILDING PERMITS.—*Second Ave., Nos.* 135 *and* 137, three-st'y brick dispensary and library building; also, one-st'y brick laboratory, tin roofs; cost, total, $75,000; owner, Oswald Ottendorfer, 7 East Seventeenth St.; architect, Wm. Schickel.

One Hundred and Fifty-second St., n s, 232′ w Third Ave., three-st'y frame tenement, tin roof; cost, $4,500; owner, Peter Killian, One Hundred and Fifty-second St. and Third Ave.; architect, A. Janson; builders, Janson & Jaeger and F. Wagner.

Philadelphia.

FACTORY.—L. M. W. Lippen, Esq., proposes to erect a six-st'y factory building, 60′ x 100′, on Garden St., above Wood St.; J. K. Yarnall, architect.

ACTIVITY IN BUILDING MATTERS.—The very large increase of permits in the last two weeks, for the erection of dwellings, indicates the manner capital is seeking investment as spring opens; between three and four hundred permits having been taken for dwellings alone, and most of them for attractive and commodious buildings; and all available ground is rapidly being appropriated for such purposes.

BUILDING PERMITS.—*Second St., No.* 111, four-st'y store, 12′ x 42′; Thos. Holt, owner.

Watts St., e s, n Federal St., two-st'y dwell., 16′ x 28′; W. E. May, owner.

Clarion St., w s, s Federal St., two-st'y dwell., 16′ x 32′; W. E. May, owner.

Tasker St., s e, bet. Dean and Griffith Sts., 2 two-st'y dwells., 15′ x 42′; Thos. P. Twibill, owner.

Philip St., No. 2053, two-st'y dwell., 12′ x 36′; Henry Dental, owner.

Cambria St., n s, e C St., 2 two-st'y dwells., 14′ x 28′; Wm. Rowson, owner.

Otis St., n s, e Front St., two-st'y stable, 16′ x 90′; Wm. Steel, contractor.

Leiper St., w s, n Arrat St., three-st'y dwell., 29′ x 93′; Wm. Keas, contractor.

Twenty-fourth St., w s, s Reed St., 3 two-st'y dwells., 16′ x 28′; Wm. Forbes, owner.

Bailey St., s s, w of Twentieth St., two-st'y dwell. and two-st'y stable, 17′ x 40′ and 16′ x 25′; Wm. Davison, owner.

Madison St., n and s s, bet. Emerald and Jasper Sts., 12 two-st'y dwells., 15′ x 44′; D. Trainor, contractor.

Mifflin St., n e cor. Otsego St., one-st'y store-house, 45′ x 58′; Edward H. Rowley, owner.

Twenty-second St., e s, s Sansom St., four-st'y dwell., 22′ x 75′; Chas. D. Supplee, contractor.

Christian St., n s, w Broad St., 3 three-st'y dwells., 18′ x 60′; Jno. Loughran, owner.

Sepviva St., s s, e Norris St., two-st'y dwell., 17′ x 52′; Chas. Martin, contractor.

Hope St., n w cor. Montgomery St., one-st'y building, 30′ x 60′; Jas. McCartney, contractor.

Birch St., n e cor. Edgemont St., two-st'y dwell., 20′ x 32′; Jno. Mitchell.

Chester Ave., e s, bet. Forty-seventh and Forty-eighth Sts., 4 three-st'y dwells., 18′ x 49′; Jas. D. Arthur, contractor.

Twenty-fourth St., w s, bet. Wright and Sharswood Sts., 6 two-st'y dwells., 15′ x 52′; J. M. Sharp, owner.

Fitzwater St., n s, w Eighteenth St., three-st'y dwell., 15′ x 42′; W. Sweeney, owner.

Tacony St., n w s, s Bridge St., three-st'y dwell., 16′ x 28′; J. S. Taylor.

Mascher St., e s, n of Dauphin St., two-st'y dwell., 18′ x 40′; S. R. Stewart, contractor.

North Front St., No. 2419, two-st'y wheelwright shop, 19′ x 54′; Amelia Kershaw.

Orkney St., w s, s of Cumberland St., two-st'y dwell., 18′ x 28′; Robert McNeill, owner.

Forty-second St., Nos. 831 *and* 833, 2 two-st'y dwells., 15′ x 42′; E. J. Lynch, contractor.

Shawmut Station, R. R. Road, two-st'y dwell., 18′ x 38′; Josiah Bickings, contractor.

Twenty-second St., w s, 281′ n of Montgomery Ave., one-st'y chapel, 30′ x 53′; O. A. Bartholomew.

Fifth St., cor. Cumberland St., store and dwell., 20′ x 60′; Wm. Smith, contractor.

Elmwood Ave., e s, bet. Seventy-first and Seventy-second Sts., three-st'y hotel, 40′ x 40′; Albert Fox, owner.

Vine St., Nos. 5526 *and* 5528, 2 two-st'y dwells., 12′ x 57′; Wm. D. Kunkle, contractor.

Reed St., No. 1808, two-st'y dwell., 16′ x 41′; Jos. McKeever, owner.

Thirty-second St., e s, s Spring Garden St., 13 three-st'y dwells., 16′ x 52′; Elkins & Peters, owners.

Church Lane, s s, bet. Greenway and Kensington Aves., two-st'y dwell., 14′ x 30′; Harry Paschall, owner.

Nicholas St., n and s s, 56 three-st'y dwells., 15′ x 44′; Jas. E. Dingee, owner.

East York St., No. 618, three-st'y dwell., 16′ x 62′; Wm. Bartholomew, contractor.

Leiper St., s w cor. Orthodox St., 2 three-st'y dwells., 24′ x 34′; Wendell & Smith, contractors.

Leiper St., cor. Allen St., three-st'y dwell., 34′ x 36′; Wendell & Smith, contractors.

Snydenham St., No. 1709, three-st'y dwell., 17′ x 53′; Jacob E. Ridgeway, owner.

Cumberland St., s s, w Fifteenth St., 8 two-st'y dwells., 15′ x 41′; W. H. Lower, contractor.

Garfield St., n s, bet. Germantown Ave. and Wakefield St., 4 three-st'y dwells., 13′ x 88′; C. Ancopp, contractor.

East Chelten Ave., n s, w Magnolia St., four-st'y factory, 57′ x 172′; F. W. Wright & Son.

Nevada St., No. 1037, two-st'y dwell., 16′ x 41′; G. N. Hart, contractor.

Christian St., n s, e Fifteenth St., 4 three-st'y dwells., 18′ x 65′; Robert Russell, owner.

Caerveson St., w s, bet. Dickinson and Tasker Sts., 11 two-st'y dwells., 14′ x 28′; Thos. Grinnan, owner.

Chestnut St., Nos. 122 *and* 124, five-st'y addition to front building, and five-st'y back building, 30′ x 59′ and 39′ x 74′; J. Bradin, contractor.

Twenty-fourth St., n e cor. Christian St., three-st'y store and dwell., 17′ x 50′; Chas. Lafferty, owner.

Juniper St., n e cor. Wynkoop St., two-st'y stable, 36′ x 56′; Nathan Meyers, owner.

Thompson St., s s, e Twenty-fourth St., 2 two-st'y dwells., 15′ x 51′; J. H. Lyons, owner.

Berks St., s e cor. Croskey Sts., 5 two-st'y dwells., 15′ x 47′; James Caven, owner.

Seventeenth St., s w cor. Vine St., two-st'y stable, 20′ x 31′; Theo. E. Sheldrake, contractor.

McCullum St., bet. Carpenter St. and Mt. Pleasant Ave., two-st'y dwell., 16′ x 37′; M. Hetzel, contractor.

Filbert St., Nos. 1227 *and* 1229, five-st'y hotel building, 44′ x 106′; Jas. M. Wells, contractor.

Twenty-seventh St., s e cor. Columbia Ave., store and dwell., 17′ x 57′; John Maylin.

Wilder St., s w cor. Eighteenth St., 2 two-st'y dwells., 17′ x 43′; Peter Sheets, owner.

Mascher St., No. 2403, two-st'y dwell., 18′ x 54′; Wm. Schoenleber, contractor.

Venango St., s s, 20′ w Janney St., two-st'y dwell., 14′ x 30′; Daniel Trainor, contractor.

Sharp St., w s, n Adams St., two-st'y dwell., 18′ x 34′; McIlvain & Cunningham, contractors.

Cresson St., e s, s Adams St., two-st'y dwell., 18′ x 32′; McIlvain & Cunningham, contractors.

Seventh St., e s, 18′ n Pierce St., two-st'y dwell., 15′ x 44′; Thos. B. Twibill, attorney.

Bainbridge St., No. 1931, three-st'y dwell., 18′ x 43′; Jessie Wills, owner.

Sixth St., w s, n Somerset St., 2 two-st'y dwells., 18′ x 36′; J. S. Baldt & Son, contractors.

Otto St., No. 161 (Germ.), two-st'y dwell., 18′ x 44′; E. Welsh, owner.

Eleventh St., w s, n McKean St., 11 two-st'y dwells., 16′ x 40′; B. Harvey, owner.

Locust St., No. 610, three-st'y factory, 20′ x 50′; Geo. W. Payne, contractor.

Reese St., w s, n York St., 12 two-st'y dwells., 14′ x 47′; A. F. Richards, contractor.

Eighteenth St., n e cor. Tasker St., two-st'y dwell., 18′ x 47′; Geo. Estlack, owner.

Bell St., e s, s Baring St., 2 three-st'y dwells., 12′ x 30′; Thos. C. Sloan, contractor.

Van Pelt St., w s, n Berks St., 5 two-st'y dwells., 14′ x 44′; J. R. Pyle, contractor.

Tioga St., s s, e Edgemont St., two-st'y dwell., 16′ x 32′; M. Donahue, owner.

Fifteenth St., n e cor. Mt. Vernon St., 13 three-st'y dwells., 20′ x 74′; J. M. Sharp, owner.

The American Architect and Building News

ADVERTISERS' TRADE SUPPLEMENT.

No. 13. SATURDAY, JUNE 2, 1883. Volume XIII. No. 388.

YALE PATENT "SCREWLESS" DOOR-KNOBS AND SPINDLES.

Among the articles of builders' hardware door-knobs and their spindles are perhaps the most necessary, and, considering their importance and universal use, also among the most imperfect.

Although many improvements have been made in the finish and ornamentation of knobs, and occasional attempts made to remedy defects in the attachment of them to their spindles, the almost universal practice, at present, is to secure the knob to its spindle in the old-fashioned manner, by the use of a set or *side screw*, and to provide practically for adjustment by means of loose washers.

The defects of this mode of attachment are many. The screw-holes in the spindle cut the latter almost in two, thus badly weakening it, and since the smallest variation of adjustment by the several screw-holes is usually one-quarter of an inch, the adjustments to intermediate degrees have to be effected by the use of loose washers between the knob and its rose or socket; accurate adjustment in this way is impossible, and knobs thus applied have more or less looseness or "rattle," which is unpleasantly perceptible when the knob is used. Their worst defect, however, consists in the loosening and falling out of the side-screws, thereby allowing the knob to be pulled off from its spindle, and the several parts to be displaced from the door. This annoyance is one with which every architect and householder is unfortunately familiar, and one which is inseparable from the present system of attaching knobs to their spindles, no matter how carefully the goods may have been made and applied.

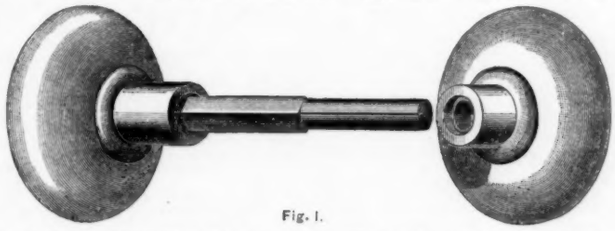


Fig. 1.

Our readers, we are confident, will be interested in a description of a new device of ours, which is packed with all our locks, and is claimed to effectively overcome every difficulty and inconvenience in the attachment and adjustment of knobs and spindles mentioned above.

Briefly described (see Fig. 2.) the spindle is square in its central portion to fit the hub of the lock, with each of its ends formed into a spiral or eccentric. A corresponding form is given to the bore of the knob shanks. The knobs are freely slipped endwise on the spindle when the latter is inserted in the knob shanks so that their eccentrics coincide. By turning the knobs, however, the two eccentric surfaces are rotated in opposite directions, thus jamming the knob-shank rigidly to the spindle, since the fine pitch or grade of the eccentric causes an enormous pressure to be thus exerted, which results in a rigid engagement of the three parts.

The eccentricity of the opposite ends of the spindle is in opposite directions, while the bore of the knob-shanks is always the same, so that any knob will fit either end of any spindle. The knobs being applied to opposite ends of the spindle are both tightened simultaneously by twisting in opposite directions, one against the other.

We make the following claim of superiority for our "screwless" knobs and spindles over those heretofore offered: —

The spindle itself is a solid piece of metal, *unweakened by any holes*. The knobs may be of any design or finish desired.

A complete set comprises but *three pieces*, viz.: one spindle and two knobs: there are *no washers, no screws*, and *no screw-holes*.

Each spindle has an adjustment of 1½ inches, and the knobs when applied are adjusted *instantly* to the *exact* thickness of the door, whatever it may be.

A pair of these knobs and their spindle when on a door constitute virtually a *unit* or single piece, the mode of connection being such as to unite the three parts solidly in engagement with one another, so that there can be none of the looseness or rattle noticeable with the common knobs.

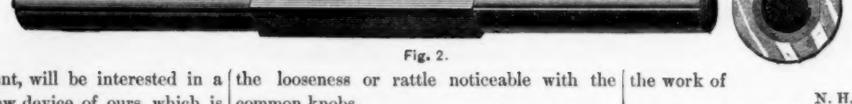


Fig. 2.

The "screwless" knobs are *instantly* applied to any door, and a material saving of time (and consequent cost) is effected by their use, a carpenter being able to apply from six to twelve pairs of the screwless knobs in the time required to adjust and apply one pair of the common kind.

Once properly applied the knobs will *always remain in order*, there being no screws to fall out, and no adjusting washers to get loose. If by any accident a pair of knobs is detached, they can be instantly re-applied and fastened by any one, without the use of tools.

All of the patents relating to the "screwless" door-knobs and spindles have been acquired by the Yale Lock Manufacturing Company, of Stamford, Conn., and the goods may be obtained from all first-class hardware dealers, from the Company at Stamford, or from their New York, Boston, Philadelphia, or Chicago salesrooms.

THE YALE & TOWNE MANUFACTURING CO.,
Stamford, Conn.

A MOSAIC GLASS DOME.

A very handsome mosaic glass dome has lately been placed over the chancel in the Church of the Incarnation, Rev. Arthur Brooks, rector, corner of Madison Avenue and Thirty-fifth Street, New York. The dome, or to speak more properly, half-dome, consists of five sections, each partly filled with black-walnut tracery, forming three principal openings. In the lower one of each section is a cross of crystal jewels with a richly colored centre of crackle jewel-work. Above this is a circular opening in which is worked a rope pattern also of crystal jewels, and at the top a mass of the jewels, forming a pendant or drop, completes the jewel-work. The background is made of a very dark yellow — almost mahogany-colored — antique crackle-glass, which throws the crystal jewels into brilliant relief, while here and there through the lower portions of the work, bits of color are inserted in the background; at the bottom being used sparingly, then more freely as the top is approached, until finally the yellow gives place to more brilliant pieces of opalescent glass ending at the top in a rich ruby, the whole forming one of the most brilliant pieces of mosaic glass-work in the city, and well worth seeing. It is the work of

N. H. EGLESTON, Jr.,
7 East Washington Place, New York.

PHOSPHOR-BRONZE.

The Phosphor-Bronze Smelting Co., limited, of Philadelphia, Pa., have just issued two very neat circulars giving some valuable hints concerning phosphor-bronze. They call special attention to the merits of what is known as Phosphor-Bronze S″ Bearing Metal, which is being very extensively used in locomotives, passenger and freight cars, marine and stationary engines and miscellaneous machinery, being applied to bearings, slide-valves, etc.

They state farther that the experience of some years has proved the reliability and value of phosphor-bronze for telephone wire, and they recommend it as possessing all the qualities essential for durable line service. A recent improvement is said to have been effected in its manufacture, by means of which the tendency to kink is entirely obviated, and the wire will now give no difficulty from this cause. It can also be put up with the same facility as other wire. The circulars also enumerate the various advantages of phosphor-bronze telephone wire, and submit a list of standard sizes that are now being turned out by them. The sole manufacturers of phosphor-bronze in the United States are the

PHOSPHOR-BRONZE SMELTING CO.,
(Limited.)
512 Arch Street, Philadelphia, Pa.

THE LOW "ART TILES."

The art tiles of J. & J. G. Low are so widely known, and their pre-eminent artistic merit is so frankly acknowledged by the leading ceramists and decorators in Europe, as well as at home, that any extended description or allusion to them might seem to imply a lack of acquaintance on the reader's part with one of the most beautiful of interior decorations. We therefore simply present a page of illustrations which we think will prove of interest to those whose tastes, desires or necessities lead them to search for the most refined features of decorative art.

BUILDING INTELLIGENCE.

General Notes.

Detroit, Mich. — Senator Palmer of Michigan has subscribed $10,000 toward the erection of a $50,000 art gallery.

Delaware Bay. — The Light-House Board is making preliminary arrangements for the construction of a light-house at Fourteen-foot Bank, Delaware Bay, for which there is an appropriation of $175,000 available. This will be the largest structure of its kind in the world.

Dubuque, Io.— F. D. Hyde, architect, has plans in preparation for the following work: —

Remodelling and enlarging the residence of L. C. Bissell, Esq., on Birch St.; cost, about $1,600.

Addition for kitchen and laundry to residence of W. L. Bradley, Esq., Locust St.; cost, about $1,000.

Two-st'y and basement brick stable, 68' x 75', for the Dubuque Omnibus Co.; to cost about $6,000.

A one-and-a-half-st'y frame "Queen Anne" cottage for F. D. Hyde, on Wilson Ave.; to cost about $2,500.

A two-st'y frame residence, cor. Fifteenth and Locust Sts., for B. B. Richards, Esq.; to cost about $10,000.

Germantown, Pa.— Plans have been submitted for the new hall of the Working-men's Club, on Chelten Ave., above Main Street.

Thomas MacKellar is about to build six houses on Coulter St., near Hancock St.

Greencastle, Ind. — C. A. Wallingford, of Indianapolis, has residence for J. A. Robe & T. C. Hammond.

Greensburg, Pa. — The following public buildings will be erected: —

County jail; cost, $134,000; architect, E. N. Butz, Pittsburgh; contractors, Hockenstein & Co., of Allegheny City.

School-building, to cost $20,477; architect, Andrew Peebles, Pittsburgh; contractor, L. Bott, of Greensburg

Presbyterian church, to cost $32,000; architects, R. & H. Fulton, Irwin Station.

Lutheran Church, to cost $25,000; architect, C. H. Grise, Cleveland, O.

Hamilton, N. Y.— Frame house for Mr. Wm. T. Manchester; cost, $8,0 0; T. I. Lacey, architect, Binghamton, N. Y.

Holyoke, Mass. — A residence is being built for Mr. Wm. A. Prentiss, from designs of Mr. W. B. Tubby, of New York; cost, about $11,000.

J. F. Sullivan, H. H. Bartlett, and A. A. Jones have all begun to build new houses.

Indianapolis, Ind. — C. A. Wallingford, architect, has new work as follows: Residence for A. H. Nordyke; cost, $17,000. Residences for J. W. Hadley, E. Hege, S. A. Clark, W. T. Fenton, Miss Hamilton, D. M. Ransdell, Jackson Landers; average cost, $5,000 each. Also, Flower Mission Hospital; cost, $8,000.

E. J. Hodgson is the architect of the following buildings: House for W. H. Floyd, cost $3,600. Two houses for Peter Gramling; cost, $7,500. Cottage for S. Douglas; cost $1,500. House for M. E. Vinton; cost $3,500.

Inwood, N. Y.— Two cottages, brick and frame, are to be built, at a cost of about $15,000 each, from designs of Mr. J. F. Burrows, of New York.

Jenkintown, Pa.— A stone chapel for the Baptist congregation; cost, $3,500; Isaac Pursell, architect, Philadelphia.

Laconia, N. H. — Hon. John C. Moulton will build this season a large business block.

Larchmont, N. Y.— One-st'y stone building in the Gothic style, to be used for stable, boat-house and billiard-room, is to be built for Mr. C. D. Shepard, at a cost of not less than $15,000, from designs of Messrs. Smith & Kelley, of New York.

Long Prairie, Minn. — Proposals for building a court-house and jail for Todd County were received May 1, by the County Commissioners.

Marion, Ind. — Block for Jason Wilson; cost $38,000. E. J. Hodgson, architect, Indianapolis.

Milton, Mass. — A house has just been begun for Wm. Rotch Ware.

Mobile, Ala. — A three-st'y brick store, with offices above, 42' x 74', is to be built on the cor. of Dauphin and St. Emanuel Sts., for Mr. E. C. Spotswood, at a cost of $7,500; Mr. Jas. H. Hutchisson is the architect; Messrs. Monnin & Farley, the contractors. Work began April 20.

A one-st'y frame passenger depot, 50' x 350', is to built, cor. Government and Commerce Sts., for the L. & N. & G. S. R. R., at a cost of $10,400; Mr. T. J. Harrahan, architect; Mr. Louis Monnin, contractor. Work will begin at once.

Monument, Mass.— A stable for Moses Williams is to be built at once from plans of Wm. G. Preston, architect, of Boston, Mass.

Morgan Park, Ill. — House for J. A. Davol, Esq., frame; cost, about $2,800; J. N. Tilton, architect, Chicago.

Mt. Desert, Me. — A cottage for Mr. E. H. Pendleton, of Cincinnati, O., is now building from plans of Messrs. Rotch & Tilden, architects, of Boston, Mass.

Muncie, Ind. — Jail for Delaware County; cost $22,000. E. J. Hodgson, architect, Indianapolis, Ind

Newark, N. J. — Calvary Presbyterian Church, brick and terra-cotta, is now receiving estimates; probable cost, $15,000; Isaac Pursell, architect, Philadelphia.

Newbury, Mass. — Miss Ann Jaques, of Newbury, gives $25,000 for the establishment of a free hospital at Newbury.

New Garden, N. C.— Mr. Geo. A. Archer, architect, Baltimore, is preparing plans for a remodelling of the several buildings of the New Garden Seminary, consisting of additional stories, water tower, etc.; cost, $9,000.

Newport, R. I. — Mrs. G. K. Warren has purchased land on Gibbs Av., and will build a cottage.

Newton, Mass. — The Baptists are to build a $50,000 church.

Nichols, N. Y.— Brick block of four stores and opera-house for Geo. P. Cady; T. I. Lacey, architect, Binghamton, N. Y.

Northampton, Mass. — The question of locating the new $8,000 Bridge-street school-house is unsettled.

Norwich, N. Y. — Frame house for Cyrus B. Martin; cost, $10,000; T. I. Lacey, architect, Binghamton, N. Y.

Also, brick bank-building for Albert F. Gladding.

Paterson, N. J. — Dutch Reformed Church, stone building to be commenced immediately; cost, $18,500; Isaac Pursell, architect, Philadelphia.

Pautuxet, R. I. — Dr. Horace G. Miller, of Providence, has begun a house on Sea View Ave.; Messrs. Gould & Angell, of Providence, are the architects; French, Mackenzie & Co., contractors.

Peru, Ind. — C. A. Wallingford, of Indianapolis, has residence for C. C. Emswiller.

Peterboro, N. H.— School District No. 1 has voted to build a new school-house on "Hatch Lot."

Pittsfield, Mass. — The Building Committee of St. Stephen's parish are to have some fresh plans for their new church.

Plainfield, N. J. — A brick stable is to be built for Mr. J. Evarts Tracey, from designs of Mr. H. Edwards Ficken, of New York.

Pondquogue, L. I. — A frame house is to be built for Mr. John Gilsey, from designs of Mr. D. W. Willard, of New York.

Portland, Ind. — E. J. Hodgson of Indianapolis is the architect of the following buildings: Meridian St. Hotel; cost $13,000. Lebring & Marsh's block, cost $11,000. Reed & Mackinbach's block; cost $11,000. Arthur Block; cost $18,000. Block of stores for J. B. Jaques; cost $8,000.

Public Buildings. — The following list showing the public buildings in process of construction throughout the country will especially interest dealers in building supplies, etc.: —

Abingdon, Va., court-house, post-office, etc.
Albany, N. Y., custom-house and post-office.
Baltimore, Md., post-office and court-house.
Baltimore, Md., marine hospital.
Boston, Mass., post-office and sub-treasury.
Brooklyn, N. Y., post-office, etc.
Buffalo, N. Y., custom-house and post-office.
Cleveland, O., custom-house, etc.
Cairo, Ill., marine hospital.
Cincinnati, O., custom-house and post-office.
Cincinnati, O., marine hospital.
Charleston, W. Va., post-office, court-house, etc.
Concord, N. H., post-office, court-house, etc.
Columbus, O., court-house, post-office, etc.
Council Bluffs, Iowa, post-office, etc.
Dallas, Tex., court-house, post-office, etc.
Denver, Col., court-house and post-office.
Des Moines, Iowa, court-house and post-office.
Detroit, Mich., court-house, post-office, etc.
Erie, Pa., court-house, post-office, etc.
Frankfort, Ky., court-house, post-office, etc.
Fort Wayne, Ind., court-house, post-office, etc.
Galveston, Tex., court-house, post-office, etc.
Greensborough, N. C., court-house, post-office, etc.
Hannibal, Mo., post-office, etc.
Harrisonburg, Va., court-house, post-office, etc.
Jackson, Miss., court-house, post-office, etc.
Jackson, Tenn., court-house, post-office, etc.
Jefferson City, Mo., court-house, post-office, etc.
Kansas City, Mo., custom-house and post-office.
Leavenworth, Kan., court-house, post-office, etc.
Louisville, Ky., court-house, post-office, etc.
Lynchburg, Va., court-house, post-office, etc.
Memphis, Tenn., custom-house and post-office.
Memphis, Tenn., marine hospital.
Marquette, Mich., court-house, post-office, etc.
Minneapolis, Minn., post-office, etc.
Montgomery, Ala., court-house, post-office, etc.
New Orleans, La., custom-house and post-office.
New Orleans, La., marine hospital.
Oxford, Miss., court-house, post-office, etc.
Paducah, Ky., post-office, court-house, etc.
Peoria, Ill., post-office, court-house, etc.
Pensacola, Fla., court-house, post-office, etc.
Poughkeepsie, N. Y., post-office, etc.
Pittsburgh, Pa., court-house and post-office.
Pittsburgh, Pa., marine hospital.
Philadelphia, Pa., post-office and court-house.
Quincy, Ill., post-office, court-house, etc.
Rochester, N. Y., court-house, post-office, etc.
Scranton, Pa., post office, etc.
Shreveport, La., post-office, court-house, etc.
St. Louis, Mo., custom-house and post-office.
St. Joseph, Mo., post-office, etc.
Syracuse, N. Y., post-office, court-house, etc.
Terre Haute, Ind., post-office, etc.
Toledo, O., custom-house, etc.
Topeka, Kan., court-house and post-office.
Washington, D. C., new pension building.
Washington, D. C., State, War and Navy buildings.
Williamsport, Pa., court-house, post-office, etc.

Reading, Pa. — Mr. Geo. Ermentrout is having a frame house built; Jno. J. Deery, architect, Philadelphia.

Rochester, N. Y. — A large brick building, 50' x 98', four-st'y, with Lockport stone and marble finish, is being erected on the cor. of Jones and Centre Sts., by Mr. H. Fitz Simmons.

Contract just let for building cor. Erie, Canal and Exchange Sts., 40' x 140', five stories high, for Alling & Cory; H. H. Edgerton, builder; Warner & Brockett, architects.

At a recent meeting of the Board of Trustees of the First Methodist Episcopal Church it was decided to build a new church, at a cost of $50,000; plans to be prepared immediately.

Rockaway, L. I. — The Episcopal church is to be rebuilt and enlarged from designs of Mr. H. Edwards Ficken, of New York.

Rome, N. Y. — Mr. A. Russell, of Syracuse, architect, has on his boards a block of stores, four stories high; also a church for a Welsh Calvinistic Society, to cost $3,000; also, 2 dwells. for Mr. Samuel Wardner.

Roxbury, Mass.— The Committee on Education has accepted plans by Holman K. Wheeler, architect, for a brick school-house, to cost, $9,000. The proposed building will be of brick, 38' x 70'.

Scranton, Pa.—Plans for the Moses Taylor Hospital in this city have been completed by Carl Pfeiffer, of New York, and proposals for the building have been opened, but as yet the contract has not been let. The total cost of the building will reach $300,000.

Springfield, Mass. — Mrs. L. S. Tyler has broken ground for a tenement on Quincy St, and Hiram Pease is to build a house on Walnut St.

St. Cloud, Minn. — A cathedral, 60' x 140', brick, with granite finish, is to be built at a cost of about $60,000, from designs of Mr. Wm. Schickel, of New York.

St. Johnsbury, Vt. — The sisters of the Congregation de Notre Dame have begun a convent; to cost, $20,000.

Syracuse, N. Y. — Building operations in Syracuse are confined principally to the completion of structures already under way; the high prices ruling for labor and materials being a hindrance to new projects. The following list comprises nearly all new work in the hands of the architects at present:

Presbyterian church for Oneida, in brick, with stone finish, to cost $25,000; White & Grodavent, architects.

Frame dwell. for Mr. F. Blodgett; cost, about $4,000; J. H. Kirby, architect.

Block of three houses for Mr. Case, to cost $8,000; J. H. Kirby, architect.

Double dwells., semi-detached, brick; cost, $10,000; J. H. Kirby, architect.

Tarrytown, N. Y.—Work on the new light-house to be erected at Kingsland's Point has been begun.

Ware, Mass.— The George H. Gilbert Manufacturing Company will build a weaving-room, 222' long on the river side.

Waterloo, N. Y. — Mr. A. Russell, of Syracuse, has designs for a Methodist Society, to cost $20,000.

Washington, D. C. — A number of the prominent members of the New York Avenue Presbyterian Church, have decided to build a new church, and leave the present congregation.

Webster, Mass. — The Congregational Society has voted to raise $14,000 for a new church.

Westfield, Mass. — It has been voted, to give the school committee and selectmen power to locate and build a school-house on Mill St.; also to build a school house on Union St.

Westerly, R. I. — The cellar of the Fowler House, High St., is being cleared for the building for I. B. Crandall & Co., clothiers.

Stable Fittings.

THE LARGEST MANUFACTURERS
IN THE UNITED STATES
— OF —

STABLE FITTINGS.

[Established 1843.]

HAY RACKS, MANGERS, ETC., ETC.

☞ Send for Prices and Catalogues.

SAMUEL S. BENT & SON,
72 Beekman St., New York.

SUPERIOR
COPPER WEATHER VANES.
Gilded with Pure Gold.

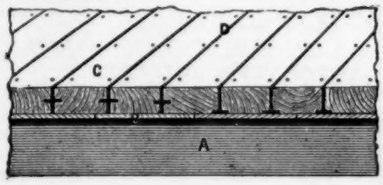
THOS. W. JONES, 213 Pearl Street, New York.
Successor to Chas. C. Briggs.
" V. W. Baldwin.

Vanes made from any drawing or design on short notice.
Illustrated Catalogue of over 200 designs mailed to any address. Mention this paper.

Stable Fittings.

DOLBEARE'S Water-Tight Wood Floors.

Architects and Builders will find in Dolbeare's Water-Tight Wood Floors an improvement long sought for, combining lightness, durability, and absolute water-tight qualities. For horse-car, livery, and private stables, it is rapidly taking the place of caulking or concreting. For slaughter-houses, currier's shops, factory floors, bridges, etc., it is highly recommended. In first-class stores, hotels, and public buildings, by the use of this floor it is absolutely impossible for goods or ceilings to be damaged by water leaking through the floor in case of fire, bursting of water-pipes, etc.



Patented June, 1882.

In the above cut an end or sectional view is shown B representing a 7-8 matched boarding on Floor Timber, A, C showing a 3-inch planking with 3-8 Rabbetting or Groving (this can be laid in thickness from 1 inch, upwards), and D showing the Filling in the seams, applied hot, which, when set, is thoroughly adhesive to the wood and sufficiently elastic to allow for any ordinary shrinking, swelling or settling.

Orders respectfully solicited, and personally attended to, by addressing

W. L. DOLBEARE,

Atlantic Avenue, Fort Hill Wharf, Boston.

MIDDLESEX HORSE RAILROAD COMPANY.
BOSTON, June 14, 1882.

W. L. DOLBEARE, Esq.

Dear Sir:—It affords us pleasure to recommend your process for "Making Floors Absolutely Water-Tight." In our new Bunker-Hill Stable, where we have stalls on three floors (one directly over the other), it has given the most perfect satisfaction, and makes no extra strain upon the walls of the building, as would be the case if the old method of "Caulking" was resorted to. In very many respects I regard your floor as very much superior to any caulked floor. Very truly, CHARLES E. POWERS, Pres

SAMUEL D. KELLEY, ARCHITECT.
BOSTON, June 21, 1882.

W. L. DOLBEARE, Esq.

Dear Sir:—I have used Dolbeare's Improved Water-Tight Wood Floors for stable purposes to the extent of about fourteen thousand (14,000) square feet, and they have given complete satisfaction. I consider it superior to caulking or other Improved Water-Tight Floors. Yours, &c.,
SAMUEL D KELLEY.

SOMETHING NEW FOR THE STABLE!

READ'S PATENT HARNESS BRACKET,

An Article long wanted but never befor made.

Holding the whole harness, taking no more room than the ordinary hook or peg, and can be used for both single and double harness. The harness can be placed upon or removed as easily as on the common hook, and give the harness-case a neat and finished appearance, as it carries the harness up uniformly in width with the saddle, beside keeping the bridle and breastplate in their proper shape. They are neatly japanned, with gilt facings. Price **$24** per dozen. Are now in use in over 100 first-class private stables in and about Boston, and are indorsed and approved by the following named gentlemen, all of whom have them in use:

BOSTON: R. H. White, J. M. Sears, J. T. Morse, Jr., Thos. Motley. CAMBRIDGE: F. A. Kennedy. PORTSMOUTH, N. H.: Hon. Frank Jones. MILTON: H. P. Kidder, Col. H. S. Russell, J. M. Forbes. DEDHAM: A. W. Nickerson. NEWTON: J. C. Potter. SALEM: Dr. W. Saunders. WALTHAM: J. H. Ellison. READVILLE: C. G. White. BEVERLY: Dr. Chas. Haddock. SWAMPSCOTT: C. P. Curtis.

Each bracket lettered **"J. J. Read, Boston, Mass."** For sale by dealers everywhere.

The public are cautioned against all similar brackets, not marked with my stamp, as such brackets are infringements of patents held by me.

JAMES J. READ, 13 Tremont Row, Room 10.

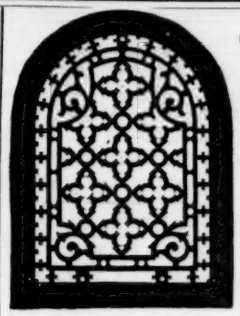
THE OPEN FIREPLACE IN ALL AGES.

By J. P. PUTNAM. 1 vol. 12mo. Price $4.00.

With 269 illustrations of famous fireplaces of historical and artistic interest, together with original designs and suggestions for modern use.

*** For sale by all booksellers, or will be sent, post paid, on receipt of price, by the publishers,*

JAMES R. OSGOOD & COMPANY,
211 TREMONT ST., BOSTON, MASS.



— THE —

Tuttle & Bailey M'f'g Co.

MANUFACTURERS OF

WARM AIR REGISTERS and VENTILATORS.

Unusual Sizes or Finish Made to Order from Architects' Drawings.

A SPECIALTY OF FINE

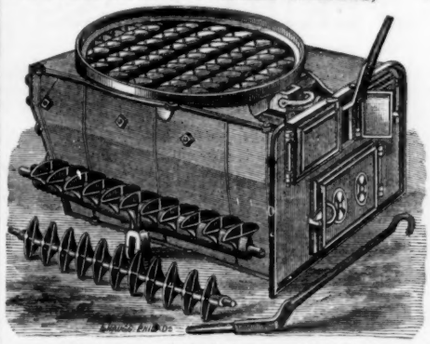
Brass, Real Bronze, Nickel and Enamelled Goods.

83 Beekman St., N. Y. No. 64 Union St., Boston.

FIRST-CLASS HEATING APPARATUS.

J. REYNOLDS & SON,

THIRTEENTH AND FILBERT STREETS, - - - PHILADELPHIA, PA.



MANUFACTURERS OF

WROUGHT-IRON

Air-tight Furnaces,

KEYSTONE

WROUGHT-IRON FURNACES,

Brick-set and Portable.

For Anthracite and Bituminous Coal or Wood.

Our Heaters are strictly first-class, made of the best material and workmanship, and are supplied with the Reynolds' Shaking Grate, the best labor and fuel-saving appliances. They are absolutely Gas, Dust, and Smoke-tight. Cooking Ranges, Low and Half-low Grates, in great variety of styles and sizes. Descriptive Circulars sent free to any address. The trade supplied.

THIRD ANNUAL EXHIBITION

— OF —

The New England Manufacturers and Mechanics' Institute.

Will be held in Boston, Mass., from Sept. 5, to Nov. 3,

1883.

Ten Acres of Floor Space.

Half Mile of Shafting.

NO ENTRY FEE. NO CHARGE FOR SPACE.

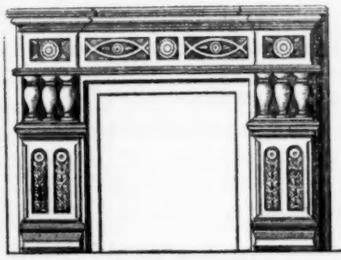
A GRAND NATIONAL INDUSTRIAL EXPOSITION.

Showing the Rich and Varied Resources of the South, the Products of the West, and the Inventive Genius and Mechanical Ingenuity of the North.

The Exhibitions of the Institute offer unparalleled opportunities for showing the progress in mechanical arts or for introducing new inventions.

Artists, Inventors, Mechanics and Manufacturers of America cordially invited to contribute. For application blanks or particulars address

JOHN F. WOOD, Treas., 38 Hawley St., Boston, Mass.



LARGEST MANUFACTURER OF MARBLE,

Marbleized-Slate and Hard-Wood Mantels,

MIRRORS, OPEN FIREPLACES, GRATES.

Imported Tiles for Hearths, Facings, and Vestibules,

LARGE ASSORTMENT, NEW DESIGNS.

ADELBERT S. NICHOLS,

(Successor to W. D. & A. S. NICHOLS.)

73 HUDSON ST., NEW YORK.

Factory: 157 & 159 E. 128th St.

HELIOTYPE.

PERMANENT PHOTOGRAPHIC BOOK ILLUSTRATIONS.

Special attention paid to the Reproduction of Architects', Engineers' and Surveyors' Drawings.

THE HELIOTYPE PRINTING COMPANY

ARE PRODUCERS OF BOOK ILLUSTRATIONS AND REPRODUCTIONS BY THE HELIOTYPE PHOTO-LITHOGRAPHIC AND PHOTO-ENGRAVING PROCESSES.

Employed by the U. S. Government in illustrating Scientific and Medical Reports; by Scientific, Historical and other learned Societies; by the leading Publishers, and for illustrating Town and Family Histories, etc.

Facsimiles of Medals and Coins, Ancient MSS., Paintings, Drawings, and Sketches, Views and Portraits from Nature, Medical and Scientific Objects, Antiquities, etc., etc. For terms and specimens apply to the

Heliotype Printing Company, 211 Tremont Street, Boston, Mass.

Vases made from any drawing or design on short notice. Illustrated Catalogue of over 200 designs mailed to any address. Mention this paper.

IRON ROOFING.

ELASTIC JOINT

IRON ROOFING.

Manufactured and sold by us in all parts of the country, from Texas to Minnesota for the past

EIGHTEEN YEARS.

Boxed ready for shipping.

ORDERS Promptly Filled.

Caldwell & Co.,
130 W. Second St.
CINCINNATI.
Send for Circular.

FIRE, WIND Water Proof Roof

Easily Applied.

Contraction and *Expansion* fully provided for. No Solder, no Nails through the Roofing, no Lightning Rod required.

BUILDING PAPERS.

Established 1853.

JOS. STELWAGON'S SONS,

MANUFACTURERS OF

MANILLA,
ROOFING,
SHEATHING,
BUILDING and
CARPET-LINING

PAPERS,

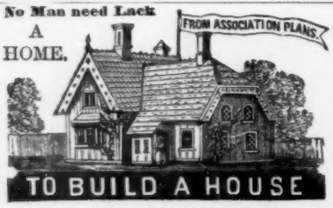
AND

ROOFING MATERIALS,

525 COMMERCE ST., PHILADELPHIA.

HOMES.

No Man need Lack A HOME.



of any kind, first decide **WHAT** to build, then **HOW** to build, by getting our book, which gives a wide range of approved and practical designs from dwellings costing $500 up to $20,000. Large quarto, 178 illustrations.

"A large and handsome publication, profusely illustrated, interesting to any reader, and of peculiar interest to an intending builder, as it is calculated to save him time, labor and money."—*N. Y. Independent.*

"We have thoroughly examined the work, which proves to be of great interest to those intending to build, and we consider it a practical scheme and a responsible association."—*Christian at Work.*

"Practical, beautiful and economical plans. The wonder is that a publication of this kind has not been issued before."—*N. Y. Weekly Witness.*

The only low-priced architectural book, and the most helpful building scheme ever offered. Price 50 cts., by mail, postpaid. Stamps taken. *Money returned if not satisfied.*

CO-OPERATIVE BUILDING PLAN ASSOCIATION,
24 Beekman St. (Box 2,702), New York.

JUSTUS J. SMITH.

This space will be occupied by
JUSTUS J. SMITH.

ARCHITECTURAL BOOKS.

This space will be occupied by
WILLIAM T. COMSTOCK, PUBLISHER,
6 Astor Place, New York.

WINDOW-SCREENS.

ANDERSON'S
PATENT EXTENSION WINDOW-SCREENS
And Screen-Doors,
METALLIC SLIDING WINDOW-SCREENS,
PAT. AUTOMATIC WINDOW-SASH BALANCE
And Flexible Stop-Beads.
Wm. G. ANDERSON, Manufacturer,
178 Washington & 17 Devonshire Sts., Boston.

STEAM FITTERS.

WOODMAN & WARNER, - STEAM FITTERS.

STEAM WARMING AND VENTILATING APPARATUS,

WROUGHT-IRON PIPE, FITTINGS, ETC.

226 AND 228 LAKE STREET AND 16 TO 22 FRANKLIN STREET,

SPECIFICATIONS PREPARED. CHICAGO. ESTIMATES FURNISHED.

RANGES, STEAM-TABLES, &C.

FRANCIS MORANDI & SON,

Hotel, Restaurant and Kitchen Goods,

FRENCH RANGES, STEAM TABLES, ETC.

50 Union & 37 Friend Sts., Boston.

☞ Send for Catalogue.

HOUSE-FURNISHING GOODS.

CHINA, GLASS

AND ALL

House-furnishing Goods.

Complete Outfits for House-keeping. Brass, Copper, Iron and Tin Kitchen-Utensils, Wooden-ware, Refrigerators, Cutlery, etc.,

At Lowest Current Market Prices.

Send for catalogue and price-list.

Hadley's, Cooper Institute, N. Y.

SLATE MANTELS.

Established 1850.

Empire Slate Mantel Works,

1215 RACE STREET, PHILADELPHIA,

SLATE MANTELS,

All the latest designs. Slate-work of every description. Send for catalogue and estimates.

WALTERS & BRADWAY, Props.

WOOD MANTELS.

C. J. SOYARD & CO.,

Designers and Manufacturers of

WOOD MANTELS,

Furniture and Interior Decorations.

16 and 18 CANAL STREET, BOSTON.

STALL FLOORS.

Jones' Stall-Floor.

Feed-Boxes, Hay-Racks,
Harness-Brackets and Stable-Fittings

Of every description. Illustrated catalogue sent free.

M. D. JONES & CO.,
88 Washington Street, Boston.

FIRE-PROOF MATERIALS.

FIRE-PROOF

Building Materials.

THE UNION FIRE-PROOF COMPANY.

Manufacturers of Hollow and Solid Blocks of Hydraulic Lime for Partitions, Furrings, Ceilings, Mansard Roofs (Deafening). Columns and Girder Linings, &c., &c. Flat Arches and Blocks of any shape made to order.

N. B. We take Contracts to set Hollow Burnt-Clay Arches and Partitions.

Office and Factory, WEST 70th STREET,
Between 10th and 11th Avenues.
New York.

LEONARD DE RACHE, Manager.

BUILDERS SUPPLIED.

TUCKER GREASE-TRAP.

In Hotels, Restaurants and Clubs the

Tucker Grease-Trap

Will save enough Grease to pay for itself in a short time besides

Preventing the Choking-up

Of Drains. In First-Class Residences it will prove of Great Service.

MEYER, SNIFFEN & CO.,

Manufacturers of the Hellyer and Brighton Water-Closets and Sole Importers of the Royal Porcelain Baths.

46 & 48 Cliff St., New York.
1 Pemberton Sq., Boston.

IRON ROOFING.

EUREKA IRON ROOFING CO.

MANUFACTURERS OF

CURRIER'S PATENT ROOFING.

53 EAST FRONT ST., CINCINNATI, OHIO.

STEAM-FITTERS.

BROGAN & SMITH,

Practical

STEAM-FITTERS.

Steam and Hot-Water Heating in all its Branches. Estimates furnished on application.

812 RACE ST., PHILADELPHIA.

HOT-WATER BOILERS.

ELLIS' BASE BURNING BOILER.

For Warming Dwellings, Green-Houses, etc., etc.

CENTRE STREET, COR. HESTER STREET,
NEW YORK, N. Y.

REGISTERS.

Hot-Air & Ventilating Registers.

All kinds of new and superior construction and designs in Iron, Brass, Bronze, and Plated.

Also fine Iron and Brass or Bronze Ornamental Work of best quality. Catalogues sent.

W. G. CREAMER & CO.,
96 John St., N. Y.

HOUSEHOLD BRASS GOODS.

DUNN & SOUTH,

SUCCESSORS TO
M. GOULD'S SONS & CO.

Stair-Rods, Curtain-Poles, Fenders, Andirons, Fire-sets, Flemish Mirrors, Plaques and other Fancy Brass Goods.

8 NORTH SIXTH ST., PHILADELPHIA, PA.

WOOD MANTELS, &C.

T. B. STEWART & CO.,

MAKERS OF

Fine Wood Mantels,

Mirrors, Sideboards, Book-Cases, &c.

21 East Seventeenth St., NEW YORK.

Second door west of Broadway.

GAS-FIXTURES.

BUY

GAS-FIXTURES

OF THE MANUFACTURERS.

Estimates Furnished.

C. H. McKENNEY & CO.,
634 & 636 Washington Street, - - Boston.
Opposite Boylston Street.

PERMUTATION LOCKS.

Stemwinding
Permutation Lock, No. 125

for any Till, Desk, Drawer or Closet. Made upon new and improved principles. Owner may use any 4, 3, 2, or 1 of its 5 numbers. Millions of changes at command. Security unrivaled. Price $2.50. All who use Padlocks for security, should examine "Miller's 6-Lever:" all dealers keep them. Our Master-Keyed Padlocks merit special notice. For Illustrated Circulars address the Man'f'r's.

D. K. MILLER LOCK CO., PHILADELPHIA, PA.

BOOKS.

"Full of admirable hints and plans."—*Chicago Standard*

The HOUSE that JILL BUILT after Jack's Proved a Failure. A Book on Home Architecture. By E. C. Gardner, Architect. *Profusely Illustrated* with exterior and interior views, floor-plans, diagrams, etc.

12mo $1.50.

"Gives valuable information regarding all parts of the house, from the sub-drains . . . through the foundation walls, the floors, roof and ceilings, the windows, doors, blinds, casings and mouldings, to wall-paper and draperies . . . water, waste and heating pipes."—*Rochester Herald.*

FORDS, HOWARD & HULBERT, NEW YORK.

ELECTRIC BELLS, ETC.

ELECTRIC BELLS, ANNUNCIATORS and Electric Gas Lighting

For Hotels and Private Residences a specialty.

Architects and builders will find all our materials to be of the very best quality and our work first-class in every detail.

BLODGETT BROS. & CO.,
63 KILBY STREET, BOSTON, MASS.

WINDOW GLASS.

WINDOW GLASS.

Polished Plate.

ROUGH PLATE, FLUTED, GROUND, AND ENAMELLED GLASS.

HILLS, TURNER & CO.,
No. 135 State Street, ... BOSTON.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL XIII. Copyright, 1883, JAMES R. OSGOOD & Co., Boston, Mass. No. 389.

JUNE 9, 1883.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS.

SUMMARY: —

The Hill-Murch Investigation. — Propriety of the Philadelphia City Tax on Pictures and Statues. — Protest of the American Artists in Italy against the Tariff. — The Fire-Insurance Companies during the past Year. — The Attempt on the Lands of the Zuñis. — The Pedestal of the Statue of Liberty. — A New Plan of Laying Underground Electric Wires. — The Garabit Viaduct and the Douro Bridge. — The Eucalyptus Tree. 265

SEWAGE DISPOSAL FOR ISOLATED HOUSES. — II. 267

FROM BAYREUTH TO RATISBON. — VI. 267

PREVENTION OF FIRES IN THEATRES. 269

THE ILLUSTRATIONS: —

House at Walnut Hills, Cincinnati, O. — Stores, Waterbury, Conn. — Houseat Washington, Conn. — House at Brookline, Mass. — Nimrod-Elkin, Rock River, Wis. 271

SUGGESTIONS FOR THE CONDUCT OF ARCHITECTURAL COMPETITIONS. 271

THE POWER OF EXPLOSIVES. 272

A BIOGRAPHICAL SKETCH AND ITS LESSONS. 272

MONTHLY CHRONICLE. 273

COMMUNICATIONS: —

Measuring Painter's Work. — Wooden Trusses. — Architectural Iron-work. — Geometry. 273

NOTES AND CLIPPINGS. 274

THE investigation into the mode in which the present Supervising Architect of the Treasury Department has administered his office seems to have assumed the character of a costly farce. Notwithstanding the dark predictions and sweeping denunciations thrown out months ago by the principal accusers, nothing definite has been submitted to the investigating committee; and one of the most active promoters of the inquiry has been obliged to demand access to all the records of the Architect's office, in order, as it seems, to search for some evidence to substantiate his own assertions. The other reforming enthusiast appears to have found his ardor a little damped on learning that the archives of the office over which he once himself ruled were to be overhauled in the pursuit of scandals, and has discreetly withdrawn himself from obvious participation in the proceedings. Meanwhile, the public business suffers, while the officials designated for service on the investigating committee wait for the presentation of the first item of that overwhelming mass of evidence which was said months ago to be ready for them.

A SINGULAR dispute is going on in Philadelphia in regard to the propriety of taxing pictures and statuary contained in the residences of their owners. It would seem that in that city household furniture is subjected to a separate valuation by the assessors, and is taxed by itself, and the assessors very naturally think that the pictures hung on the walls of the houses they visit, or the statues set up in the bay-windows constitute a part of that furniture which, as their instructions say, "contributes to the use or convenience of the householder, or the ornament of the house." The proprietors of these objects, many of whom, probably, have more money invested in them than in all the remainder of their house and furniture together, find the tax a serious one, and would be glad to avoid it. A meeting of such persons was held a few days ago to consider the question, and the problem which seemed likely to lead to a serious conflict between the taxpayers and the assessors was solved, as it would appear, by a most ingenious invention. The directions which the assessors are obliged to follow contain, as we have seen, a definition of furniture as something which contributes to the use or convenience of the householder or the ornament of his house; but it is evident that if pictures or statues are not used to ornament the house, but are simply stored in a detached room, called an art-gallery, or some such name, they do not fall within the assessors' definition, and are therefore not taxable. In the interest of the peace of Philadelphia, we trust that this logic will be held good, and advise architects who may intend to practise in that city to remember that if it should prevail an "art gallery" for the reception of objects to be exempted from taxation, will be required in every respectable household.

THE American painters and sculptors resident in Italy have joined their fellows in France in protesting against the discriminating duty upon works of art by foreign artists imported into this country. It is a little singular, though not unnatural, that our artists living abroad seem, without exception, to forget about the pecuniary benefit which the increase in the tariff was intended to confer upon them at the expense of their patrons, in their indignation at the want of appreciation shown by the legislature of their native land, which thrusts out, as it were, its long arm to hoist them out of the poverty and degradation in which it assumes that they must be living. It is certainly creditable to the whole profession of art that so decided a stand should have been taken upon the subject, and we are sure that those who have been instrumental in drawing up and signing the various memorials will in the end find that they have raised themselves and their country in the estimation of their foreign rivals by their generous independence. Meanwhile, the prospects of the great Boston Foreign Exhibition, which is to open next September, are said to have been seriously affected by this, as well as the other provisions of the new customs tariff. It is obvious that no maker of fine goods will trouble himself to send samples of them to a country which openly proclaims its determination to prohibit him from selling any of them; and the exhibit of foreign manufactures in any of the so-called protected classes may well be insignificant.

THE recent annual address of the president of the National Board of Fire Underwriters presents, as usual, many interesting facts. It appears that the past year has been an unprofitable one for the insurance companies, which will surprise no one who remembers the low rates of premium which have prevailed in many places; but it seems also that, contrary to the belief of most persons, the character of buildings with respect to security from fire has deteriorated, the percentage of loss to insurance having been about thirteen per cent greater last year than in 1874. A few feeble attempts seem to have been made by the companies to reach some of the causes of the increasing destruction of the property which they have to pay for, and fourteen thousand dollars has been expended in convicting and punishing incendiaries, but there are no signs of any general awakening of underwriters to the fact that they themselves are principally answerable for the losses over which they lament so loudly; and that the flimsy modes of construction now in use, for which they blame architects so unjustly and industriously, would be modified more quickly and effectually at a word from them than by the combined influence of the whole architectural profession.

THE claim made by two army officers upon the tract of land including the Nutria Springs, upon which the Indians of the pueblo of Zuñi are said to depend for their principal water supply, is to be pressed, notwithstanding the recent proclamation of President Arthur by which the springs were declared to be included in the Zuñi reservation. According to the claimants, the Zuñis can get all the water they need without going to Las Nutrias, and they visit the large springs for their own enjoyment, but not from necessity; and under these circumstances they think that they are entitled to the property. They have on their side the advantage of being supported by a politician of great influence in Washington, while the Indians are not represented at all; but it is to be hoped that justice, and, if possible, more than the usual Indian-Department justice, may be shown to this peaceful and virtuous little community of men, women and children, whose kindred have for so many centuries cultivated by their labor, and defended with their lives, the territory of which civilized rapacity can now spare them at the best but a small portion.

THE subscriptions to the fund for constructing a pedestal for the great statue of Liberty come in slowly, and it is announced that about one hundred and fifty thousand dollars remain to be raised. There is some complaint of the inaction of the committee in charge of the work, and the opinion is generally expressed that an appeal ought to be made at once to the richer men of New York. There is, however, something to be said in favor of the plan which the committee apparently has in view, to secure as many small subscriptions as possible,

before resorting to the richer men to make up the balance required after their equally patriotic, but less wealthy fellow-citizens, have done all they can. Several modes have been suggested for obtaining contributions from the poorest classes, by placing boxes in the post-offices throughout the country, in the ferry-houses, at the entrances of the great Brooklyn bridge and elsewhere, and entertainments will undoubtedly be held in various places for the benefit of the fund. All these will help to swell the total, and as the committee, under the new arrangement, have still a year before them for collecting money, there can be little doubt of their success.

AN ingenious, and, as it would seem, intelligible mode for laying underground electric wires has been patented, and is soon to be put in practice. Every one knows that the great obstacle to the use of underground wires is found in the resistance and interference of the induced currents which each electrified wire sets up in every conducting substance near it; and many attempts have been made to overcome the effect of this induction, but without much success. By using a double wire, so that the current runs entirely around a metallic circuit, instead of returning through the ground to the starting point, the primary and induced currents neutralize each other, and the line is secure from interference; but this remedy is too expensive for common use. By treating the whole system of electric wires in a single street under a comprehensive scheme the inventors of the new method are, however, able to secure the advantage of a metallic circuit to a considerable number of single wires at once. In their project the electric-light wires, which carry the most intense current, are made the chief factor in the group, each street being furnished with two such wires, one running through it on one side, while the other returns on the opposite side, the whole forming a complete metallic circuit, such as is usually employed for electric lighting. Between the electric-light wires are laid the telephone wires, not twisted into a cable, but placed one-quarter or one-half an inch apart in a water-proof trough. This trough, instead of continuing in a direct line along the street, has the peculiarity of crossing it at short intervals from one side to the other, bringing the wires which it contains within reach of the induction from the electric-light wires on each side. As the current in the latter passes in one direction on one side, and in the reverse direction on the other, the current induced by it in the telephone wires changes in direction at each transfer of these from one side of the street to the other, and the opposite induced currents in each single wire, being of equal force, neutralize each other, leaving the line as free from interference as if it presented a full metallic circuit. The telegraph wires, for which perfect freedom from induction is not so necessary as in the case of the telephone, are to be laid straight through the streets, each group, however, being furnished with a common return wire of sufficient capacity to balance the united currents of the direct wires.

LE GENIE CIVIL gives in its last issue an account of the great viaduct of Garabit, which is now on the point of completion in the southeastern part of France. The viaduct is owned by a company which is engaged in building a railway between Marvejols and Neussargues, two towns of some importance about a hundred miles from Avignon. A river separates the two places, which are built on high plateaus on each side of the valley, and as first laid out, the railway was intended to descend from the plateau on one side by a long grade, following the course of a small tributary of the river, until it reached the bottom of the valley, then, crossing the river, to return by another gradual ascent up the course of a second tributary flowing in from the other side. This appeared, under the circumstances, to be the only practicable mode of joining the two banks of the valley, and it was not until after a thorough study of the problem that M. Boyer, the young engineer in charge of this portion of the line, resolved to advise his principals to change their scheme for the much bolder one of building a line directly across the ravine. Nothing quite so daring had ever been attempted in railway construction, but the famous bridge built by M. Eiffel across the Douro in Portugal, although of smaller dimensions than would be necessary for the present one, had proved perfectly successful, and the officers of the company were easily persuaded to hazard an experiment which would, if carried out, give them a much better line than their first plan, and at a cost nearly, if not quite, a million dollars less.

THE construction used for the Douro bridge was adopted in its main features for the other. The deepest part of the valley, including the river-bed, is crossed by an enormous iron arch, five hundred and thirty-six feet in span, and four hundred and sixteen feet high, which carries the lattice-girders of the railway, supported partly on the crown of the arch, and partly on open iron towers carried up from the haunches. Beyond the arch on each side the construction is continued by towers of iron lattice, standing on piers of masonry, and forming at the top a level bearing for the girders, which extend to a length of about a third of a mile. The roadway is carried by a double line of lattice-girders, from one hundred and sixty to one hundred and eighty feet in span, and consisting of iron Howe trusses seventeen feet deep, well braced against wind, and stiffened also by a solid iron floor, inserted about five feet below the top of the upper chords to carry the track, which is thus walled in by the girders in such a way as to render it impossible for a train to fall from the viaduct. Under the floor carrying the main rails is another track, supported from the lower chords of the girders, on which will run hand-cars carrying the men and materials needed for keeping the structure in proper condition. As will be seen by comparing the figures, the Garabit viaduct is more than a hundred feet higher than the wooden Kinzua viaduct, now in process of construction in Pennsylvania, which has been called the highest in the world; but *Le Génie Civil*, in calling attention to this fact, suggests at the same time a wholesome lesson in modesty, by reminding us that no modern work of the kind has yet approached in dimensions the viaduct of Spoleto in Italy, built in the sixth century by Theodoric, the king of what we are pleased to call a nation of barbarians, which still, after the lapse of thirteen hundred years, carries the traffic of the town as well as ever, at an elevation, according to one authority, of six hundred and fifteen feet above the bottom of the ravine which it crosses.

ALMOST every one has heard something about the admirable effect of the balsamic emanations of the eucalyptus tree in neutralizing or destroying the poison of malaria, and many persons know something of the experiment undertaken at Tre Fontane, in the Roman Campagna, by a body of Trappist monks, who planted a grove of eucalyptus in a region renowned for its unhealthfulness, and in its shelter established a convent where experiments in draining and cultivating the territory were carried on with great success. The exemption of the monks from the ordinary malarial affections of the district attracted much attention, and in 1880 a penal colony was established by the Italian Government at Tre Fontane, close to the Trappist convent, with the express purpose of extending the eucalyptus plantations, and seconding the work of the ecclesiastical pioneers. During the first two years sporadic cases of malarial fever occurred among the Government colonists, but these were attributed to infection extending from the neighboring country; the land protected by the new drains and the eucalyptus groves being looked upon as quite safe. In 1882, however, a rude shock was given to the confidence which had grown up in the success of the Trappist experiment. That year was a very dry one, and the cold weather of autumn came on early, so that the Campagna in general was remarkably free from malarial disease, and such cases as occurred were also unusually mild. One locality only formed an exception to the rule, and this locality was Tre Fontane, where every person was attacked by fever, not one escaping either in the monastery or the Government colony. Among the Trappists, who lead very wholesome and well-regulated lives, the cases were mild, but many of the convict colonists and their guards were seized with the "perniziosa," and only escaped death by immediate transfer to a purer atmosphere. This exceptional outbreak in the very place which was regarded as permanently secured against such dangers excited much attention throughout the country, and a commission of physicians and engineers has been appointed to inquire into the cause of it. Meanwhile evidence is accumulating from other sources to the effect that the aroma of the eucalyptus tree is much less efficacious against malaria than has been supposed. From Australia, where the tree grows wild, it is reported that ague is particularly common in the midst of some of the eucalyptus districts, and in Algeria it has proved of little service.